FEBRUARY 28, 1931

Railway Age

Founded In 1856

GENEVA COLLEGE LIBRARY

YOKE MAINTENANCE

Many railroads have eliminated yoke maintenance by the application of Janney Vertical Key Yokes. This yoke can be used without change to existing center sill construction and does not require new couplers. The Janney Yoke provides a flexible dependable connection between couplers and draft gears.

AMERICAN STEEL FOUNDRIES

NEW YORK CHICAGO ST. LOUIS

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Buyers Directory of Advertisers—Page 61

"ARE SOME OF THE TIES IN THAT STACK OF 2'S OVERSIZE?"

"THAT question Mr. Blank is often asked by visitors on the *International* tie yard. You know the A.R.E.A. Specifications say that ***all thicknesses and widths apply to the sections of the tie between 20 and 40 inches from the middle of the tie***—the "rail-base" in other words. This part of the tie is subjected to the hardest wear; it is essential that it be strictly up to size there.

"Now here is a tie that is marked Size 2. It looks, as you say, large enough to be a 3. The rule shows that this end measures 6½" by 8¼". But measure the dimensions along the entire length of the rail-base! We find that in one place, here, the width is slightly less than 8 inches. Thus this tie must be graded down to Size 2, though it has almost the same value in the track as a No. 3."

Each *International* tie is carefully graded so that you are assured of getting in each one the full specification size unskimped in ***measure, manufacture*** or ***selection.***

You will find that *International* offers greatest tie value, actual tie for tie, and if you will come and see *International* ties we are content to let them do their own selling.

Allow us the opportunity of figuring with you on your 1931 requirements.

International

Creosoting & Construction Co.

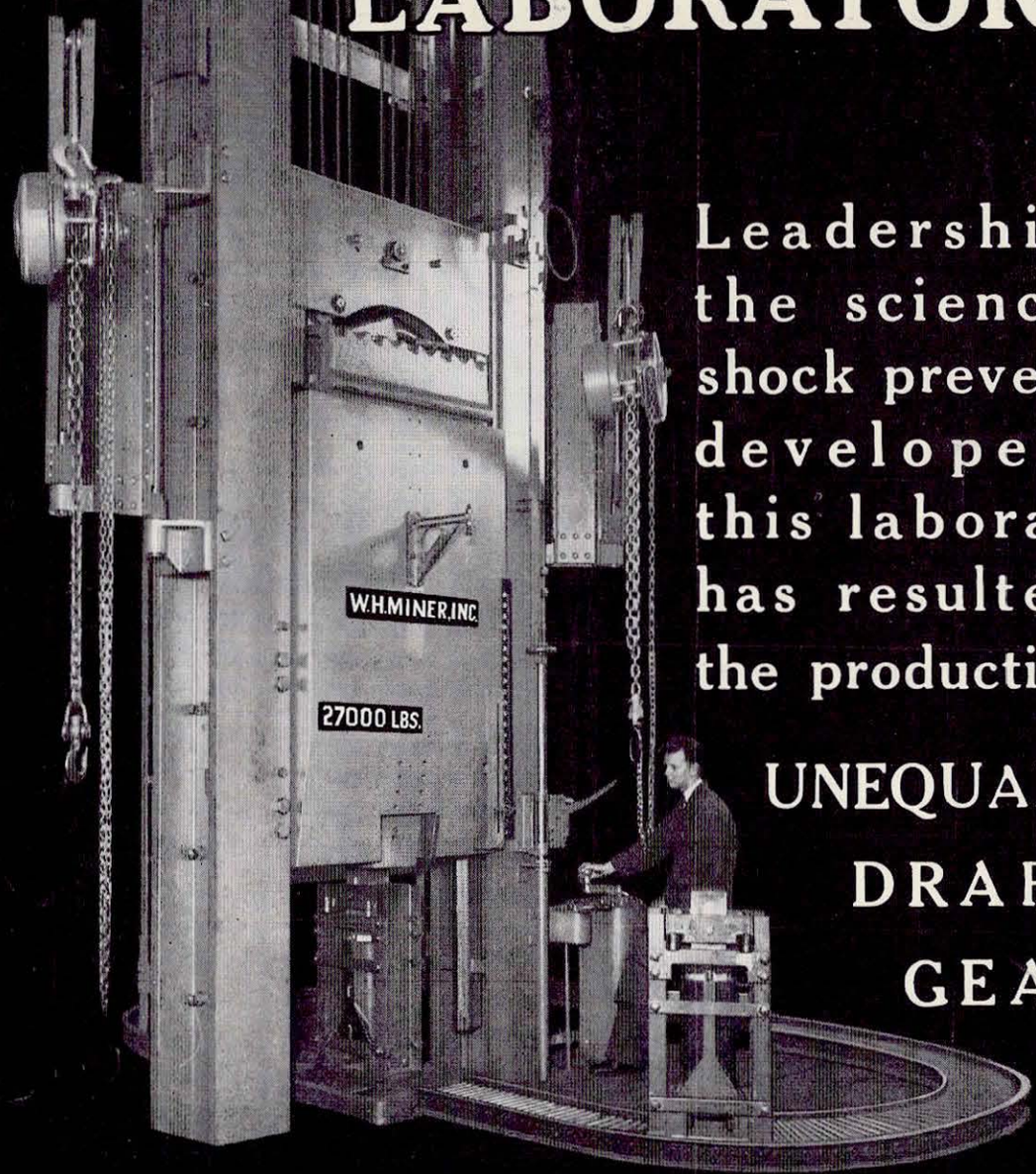
General Offices: Galveston, Texas

Plants: Texarkana—Beaumont—Galveston

Published weekly by Simmons-Boardman Publishing Company, 34 North Crystal Street, East Stroudsburg, Pa. Entered as second class matter, March 9, 1928, at the Post Office at East Stroudsburg, Pa., under the act of March 3, 1879.
Address communications to 30 Church St., New York City.

MINER

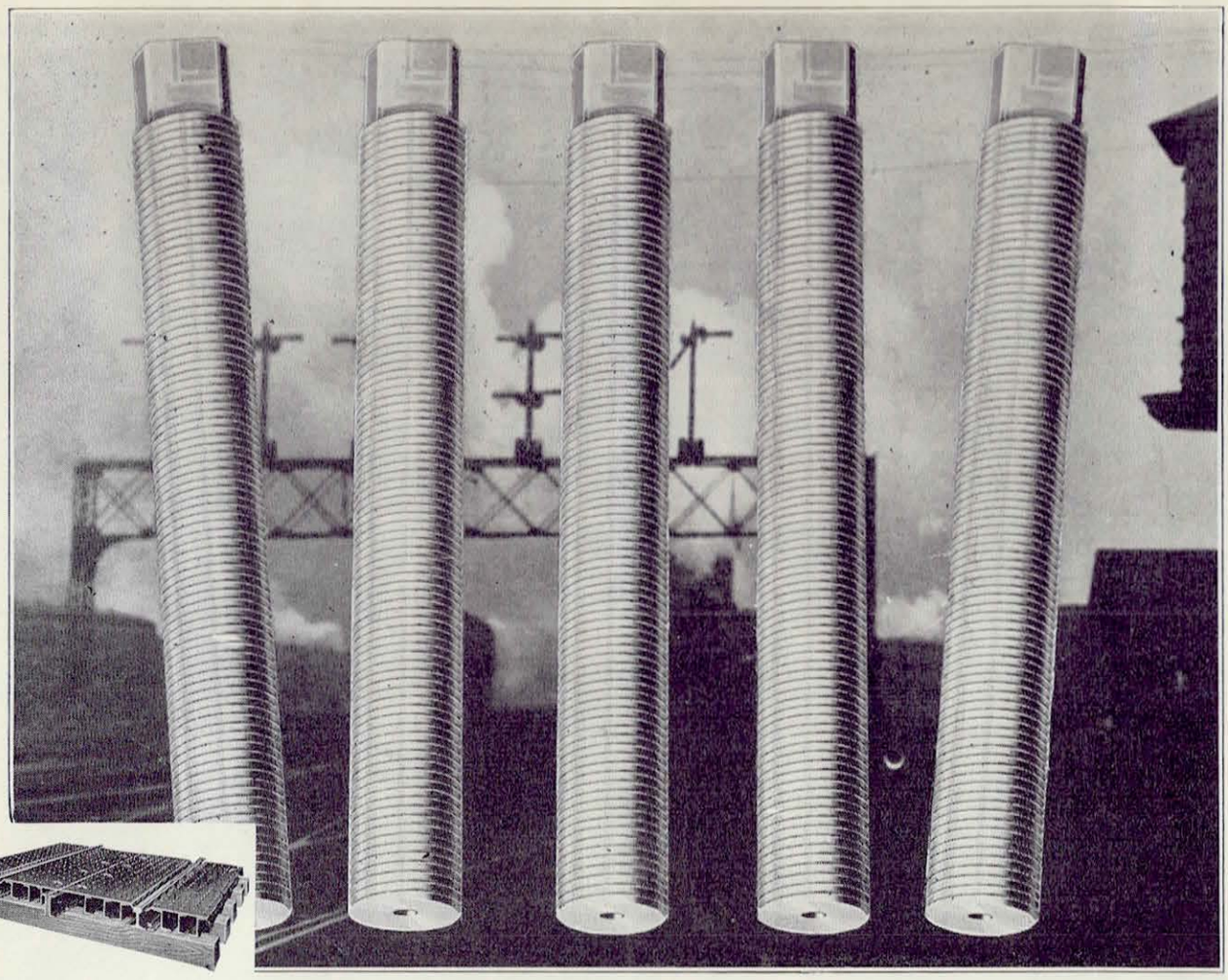
RESEARCH LABORATORY

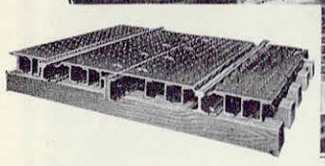


Leadership in the science of shock prevention developed in this laboratory has resulted in the production of

UNEQUALLED DRAFT GEARS

W. H. MINER, INC. CHICAGO





Ryerson All-Steel Highway Crossing

An all-steel highway crossing which combines sturdiness with simplicity of construction. It will withstand the heaviest traffic almost indefinitely. Easily installed; four men can put in an eight foot section, ready for traffic, in less than half an hour. A smooth, safe crossing which is rapidly gaining prestige with railroad maintenance men. Write for Bulletin giving complete information.

Railroad Machinery

Ryerson Flue Shop and Spring Shop Equipment is reducing costs in many large railway shops. Ryerson Machinery also includes rail reclamation plants as well as standard machine tools and metal working equipment of all kinds. Write for catalog.

You Can Depend On Lewis Special Hollow Staybolts

Write for complete information Samples and Prices

JOSEPH T. RYERSON & SON INC.

Plants: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City
Representation in: Minneapolis, Rockford, Kansas City, Tulsa, Houston, Dallas, Newark, New York, Denver, Los Angeles, San Francisco

RYERSON

RAILROAD-SERVICE

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Railway Age

With which are incorporated the Railway Review, the Railroad Gazette and the Railway Age-Gazette. Name Registered U. S. Patent Office.

Vol. 90 February 28, 1931 No. 9

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A New Era for the Railroads, Part II ..... Page 437

The second installment of a competent and detailed analysis of the present railway situation by Horatio L. Whitridge, of the stock exchange firm of J. S. Wilson, Jr. & Co., Baltimore, Md., the first part of which was published in the *Railway Age* of February 21.

Control of Railroads Analyzed for House Committee 449

An abstract of Dr. W. M. W. Splawn's report to the House committee on interstate and foreign commerce, which recommends legislation to bring all railroad holding companies under the jurisdiction of the Interstate Commerce Commission.

Rail-Truck Service Passes Experimental Stage 462

T. E. Huffman, general freight agent of the Texas & Pacific Motor Transport Company, analyzes the results of the first year of the company's freight-carrying operations, and outlines the problems now confronting it.

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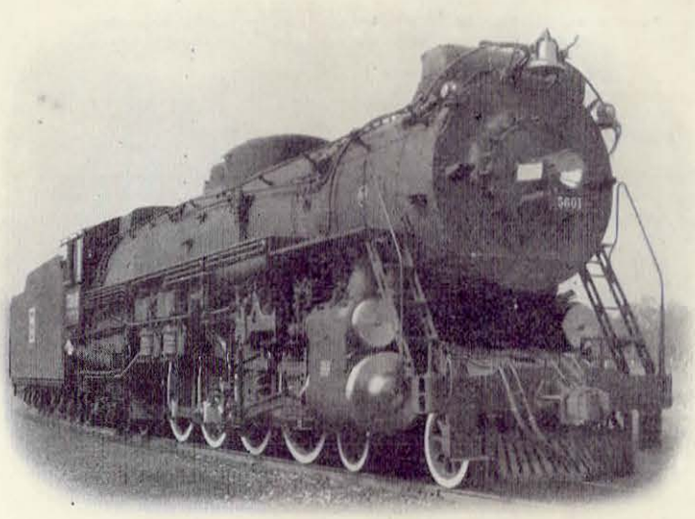
A Major Railroad Problem— Motive Power Modernization

A RAILROAD is a manufacturing plant, and its product is transportation. The degree of efficiency with which it functions depends upon many factors, one of the most important being motive power. To develop maximum operating efficiency, the locomotives must—



Be of the greatest capacity consistent with the requirements of the service.

Be suitably designed throughout for the particular work to be done.

Operate at a minimum charge for fuel, water, supplies and maintenance.

These requirements can be met only by locomotives that are strictly modern—in other words, motive power units that develop high tractive force with the maximum permissible axle loading; that produce their power on a minimum consumption of fuel and water; that have high capacity tenders permitting long continuous runs, together with other improvements of the past few years which result in lower operating costs.

Such is the strictly modern locomotive.

For the economical handling of today's traffic, motive power must embody these betterments. It is a surprising fact that only about one-fifth of all the locomotives in use in the United States can so qualify.

With our one hundred years' experience, backed by unsurpassed manufacturing facilities, we can help the railroads modernize their motive power to adequately and economically meet today's and tomorrow's traffic needs.

THE BALDWIN LOCOMOTIVE WORKS ★ 1831 1931

THE BALDWIN LOCOMOTIVE WORKS

PHILADELPHIA

FIRST

CUSTOM MANUFACTURE

of small lots by crude methods

THEN

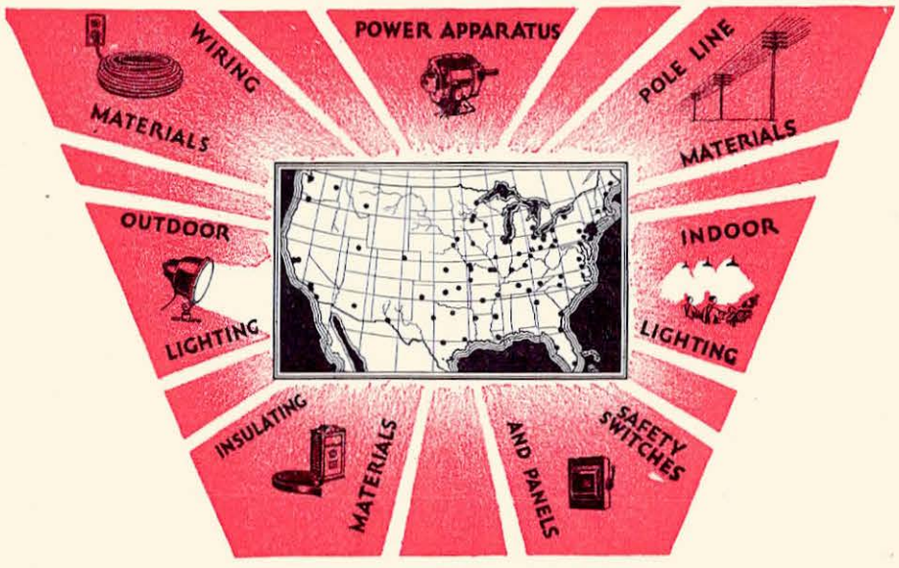
EFFICIENT PRODUCTION

but with savings lost in wasteful distribution

NOW

LOWER COST TO INDUSTRY

made possible by economical distribution *of a complete line of electric apparatus and supplies, from more than 80 wholesale warehouses, to every community in the United States.*

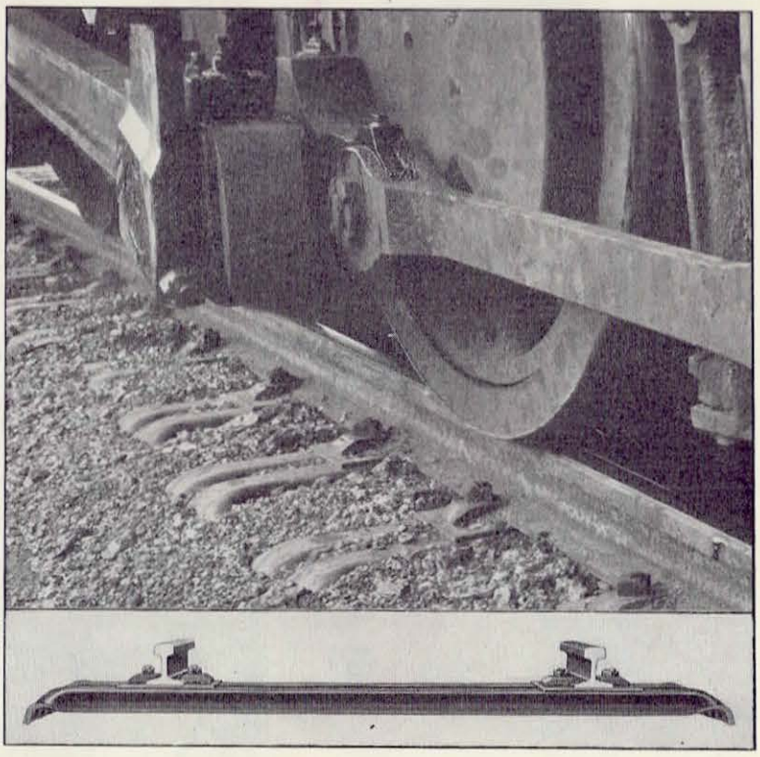


GENERAL ELECTRIC

SUPPLY CORPORATION

steel ties for heavy-duty locations

THE Keystone No. 17 Steel Tie is particularly suitable for locations where the service is extremely heavy and where the life of wood ties is comparatively short. In yards where heavy loads are moved at slow speeds and the resultant strain on ties and their fastenings is excessive, the use of these steel ties will bring many economies in reduced maintenance. Keystone Steel Ties hold the track true to gage and in alignment, preventing spreading or rolling over of the rails and consequent derailment.



At cinder dumps where wood ties quickly burn out and at water columns where fires are raked with resultant damage to the ties, Keystone Steel Ties provide a permanent track structure.

In sidings and yards, where the wood ties used are often not of the best quality, Keystone Steel Ties may be used to strengthen and reinforce the track. When used in this manner, every third or fourth wood tie is replaced by a steel tie. The steel ties then carry the full strain of the rail fastenings, prevent the spikes from shearing and the wood ties from becoming spike-killed, thus greatly prolonging the life of the wood ties.

The Keystone No. 17 Steel Tie is made of copper-bearing steel. The tie is channel shaped, with a deep, depressed rib running through the center. The ends are depressed and flared in the shape of a whale-tail, giving the tie a firm grip on the ballast and preventing lateral motion of the track. These ties have rolled steel tie plates welded to the tie and are equipped with heavy rail fastenings. The fastenings are copper-bearing steel and are securely held in position by 1-inch bolts and Unit Lock Nuts. They are applied or removed from the top without moving the tie or disturbing the ballast. A wrench is the only tool required. For more detailed information, write for folder 200-A.

Visit

The BETHLEHEM EXHIBIT

At the
National Railway Appliances
Association Exhibition
The Coliseum, Chicago
March 9 to 13, 1931

BOOTHS 69½ to 72

BETHLEHEM STEEL COMPANY

General Offices: BETHLEHEM, PA.

District Offices: New York, Boston, Philadelphia, Baltimore, Washington, Atlanta, Pittsburgh, Cleveland, Detroit, Cincinnati, Chicago, St. Louis

Pacific Coast Distributor: Pacific Coast Steel Corporation, San Francisco, Los Angeles, Portland, Seattle, Honolulu.

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BETHLEHEM

The 10 POUND Precast Roof Deck

To the Owner . . . . . means a permanent, fireproof, no-maintenance roof-deck, whose economy will be more apparent each year of its long life—a trouble-free deck that is in use today on many of the country's most prominent industrial, railroad, utility, and public buildings.

To the Architect and Engineer . . means Haydite concrete slabs with trapped air cells—light weight, which allows them to go on the same light steel frame that carries other roofs—insulating value—economy both in roof-deck and steel—structural strength—the advantage of a perfect base for weather-proof covering—long life without worry or expense to the owner.

To the Contractor . . . . . means erection of the roof-deck as fast as the structural steel goes up, in any weather and by expert workmen—anywhere around the country—a job finished on time and promptly approved.

"Catalog and Roof Standards" of interest from every angle, available on request.

Featherweight Concrete INSULATING ROOF SLABS

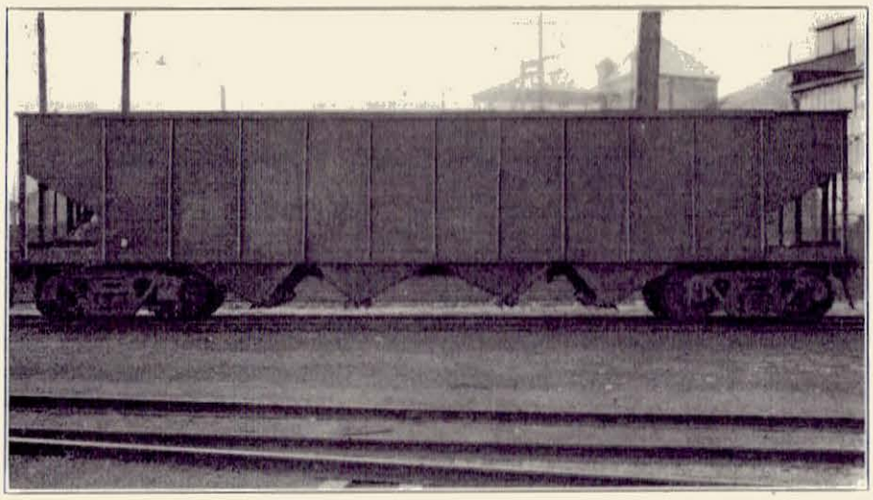
Made, Laid and Guaranteed by

FEDERAL-AMERICAN CEMENT TILE CO.

Executive Offices: 608 South Dearborn Street - - - - - - Chicago

Plants Near CHICAGO - NEW YORK - PITTSBURGH - BIRMINGHAM

FOR OVER A QUARTER CENTURY



One of twelve Ingot Iron Hopper Cars owned by a prominent eastern system. This pure, uniform iron was specified for its ease of fabrication and assurance of inexpensive service.

STEP UP TONNAGE-MILES In Your Hoppers

YOU can use ordinary plates for your hoppers and gondolas and get *ordinary service* . . . or you can invest in rust-resisting Ingot Iron plates and realize extra tonnage-miles through less maintenance.

It is easy to make the choice. And the slight difference in first cost is amply repaid in long, trouble-free service.

Back of Ingot Iron is a quarter-century of satisfactory performance—the longest record of actual service of any low-cost, rust-resisting plates and sheets. Think of what this means in eliminating blind buying. Your investment is protected by *proved performance.*

Beyond durability are definite savings in fabrication. Owing to its dense, ductile structure, this uniform pure iron forms readily and welds rapidly and soundly. Shop work is speeded, and costs decrease.

We shall be glad to study your car plate requirements, and recommend suitable grades, gages and sizes. Just get in touch with the office nearest you.

ARMCO RAILROAD SALES CO.

Executive Offices: Middletown, Ohio

DISTRICT OFFICES: New York . Chicago . Philadelphia . Cleveland . St. Louis

SPECIALLY PROCESSED

ARMCO IRON AND STEEL SHEETS

FOR EXACTING PURPOSES

ARMCO

RAILROAD PRODUCTS

- Wrought Steel Wheels
- Car Siding
- Locomotive Jacket Sheets
- Passenger Car Sheets and Plates
- Freight Car Sheets and Plates
- Galvanized Ingot Iron and Steel Sheets
- Blue Annealed Ingot Iron and Steel Sheets

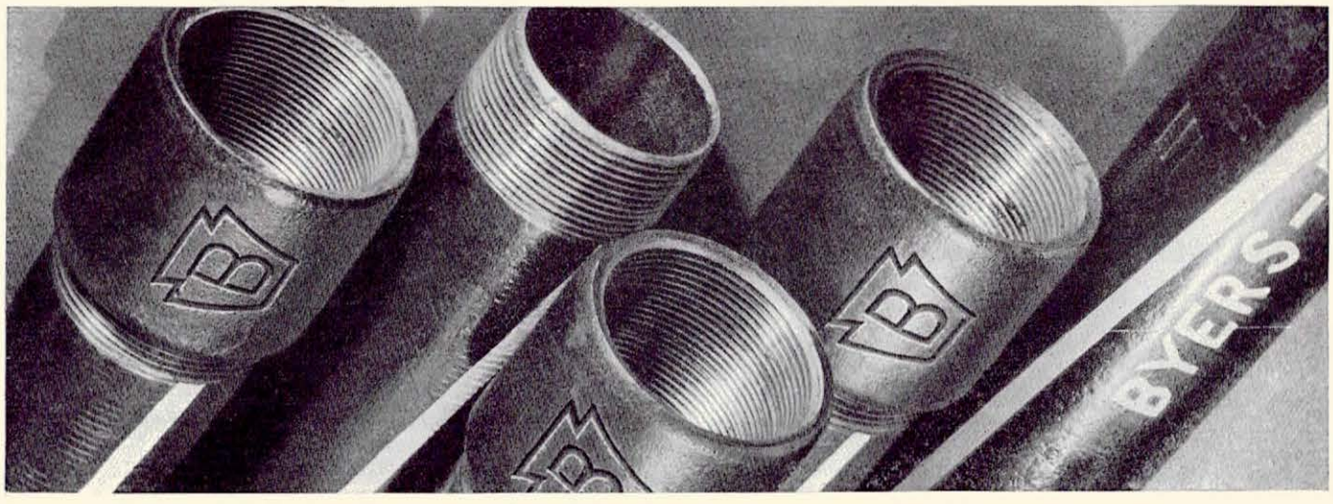
ARMCO

PERFORMANCE!

★ ★ ★

The performance of Byers Genuine Wrought-Iron Pipe, under the severest conditions of railroad service, has established it as a recognized standard of wrought-iron quality. It is easily identified by the Spiral Stripe.

BYERS • GENUINE • WROUGHT-IRON PIPE



BYERS • GENUINE • WROUGHT-IRON PIPE

Railroads are pioneers in the selection of pipe materials based on service tests. We call this railroad practice "pipe prescription." A nation-wide experience enables us to offer our services in the solution of any railroad "pipe problem." A. M. Byers Company, Pittsburgh, Pa. Established 1864.

AN INVESTMENT — NOT AN OUTLAY

An Inland Metallurgist putting a copper ingot of carefully checked weight into the open-hearth furnace . . . to make Inland Copper Alloy Steel. The copper completely dissolves in the molten steel and is distributed evenly throughout the "heat."

. . . To benefit the users of steel

INLAND is not the only company producing copper-bearing steel. In view of that fact, we are often asked: "Why do you spend so much money advertising Inland Copper Alloy Steel?"

Save with Steel
INLAND COPPER ALLOY STEEL

Our answer is simply this: We maintain that its superior resistance to corrosion and the greater economy of Copper Alloy Steel make it of paramount importance to industry, to every user of steel . . . . especially since the advantages of Copper Alloy Steel can be secured at very little added cost above ordinary commercial steel.

The value of copper in steel is not as widely known as we believe it should be . . . . and we are attempting through our advertising to acquaint steel users more fully with this important information.

What the A.S.T.M. says of copper-bearing steel

Referring to tests held by them, the American Society for Testing Materials reports—"that Copper-Bearing metal shows marked superiority in rust resistance compared to non-copper bearing metal of substantially the same general composition under atmospheric exposure."

INLAND STEEL COMPANY

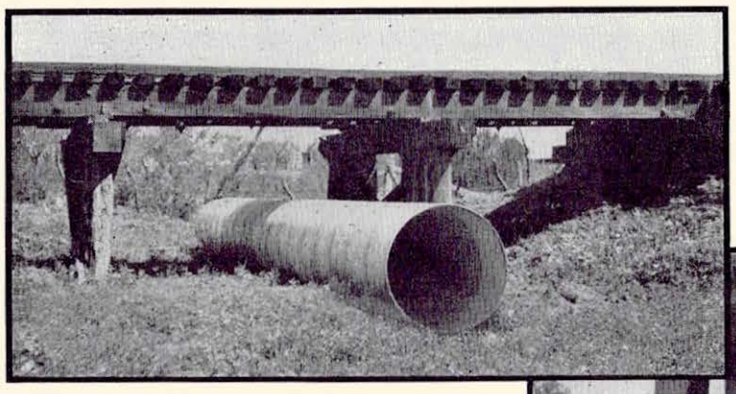
ABLE SERVANT OF THE CENTRAL WEST

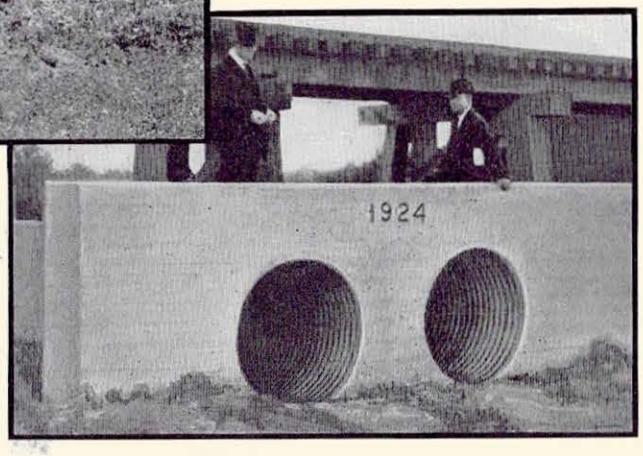
38 SOUTH DEARBORN STREET, CHICAGO

Sheets Bars Bands Plates Structurals Rails Track Accessories Rivets Billets

GREAT STRENGTH— *long-lasting* STABILITY—

proved factors of ARMCO *Culvert Bridges*





BRIDGES of Armco Corrugated Iron Pipe are rapidly dotting the drainage map of railroad America. Old and weakened trestles and small-span bridges are being replaced by this modern construction.

Tested and OK'd in "Nature's laboratory," this pure iron product has proved its great built-in strength to be more than capable of meeting the demands of heavy, pounding, speeding traffic. That makes it safe drainage construction.

Nor is it a youngster in point of service. Armco Corrugated Pipe holds the enviable record of 25 years continuous service under the railroads and highways of United States and Canada, successfully combating even severe conditions of soil and water, load and impact. Here is proof of its long-lasting stability, its great economy.

Bridges of Armco Corrugated Pipe practically eliminate the expense of inspection and maintenance. They are easy to install. For example, to eliminate a small bridge or trestle, simply lay the pipe in place, then fill. This can be done at low labor cost and without interruption of traffic.

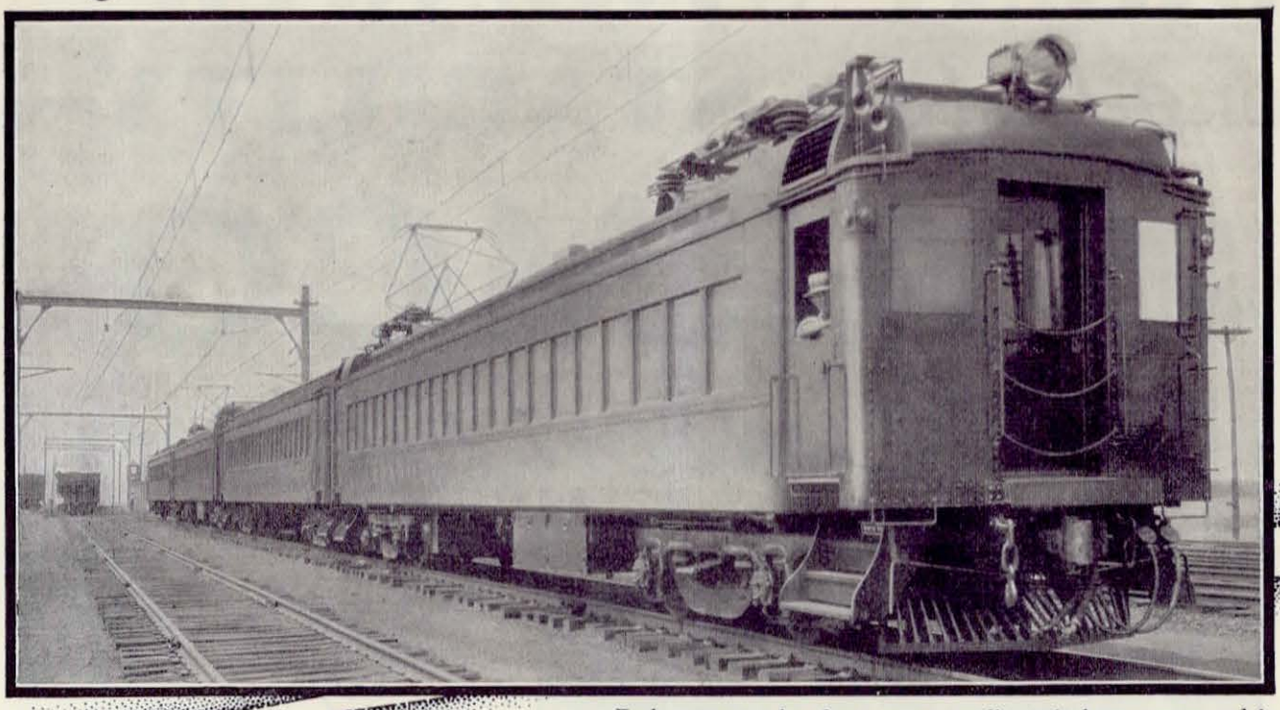
Armco engineers in your vicinity and "Drainage Headquarters" have complete data on culverts and bridge replacements—the result of extensive field studies and investigations. Write for this data.

Armco culverts and drains are manufactured from the Armco Ingot Iron of the American Rolling Mill Company and always bear its brand.

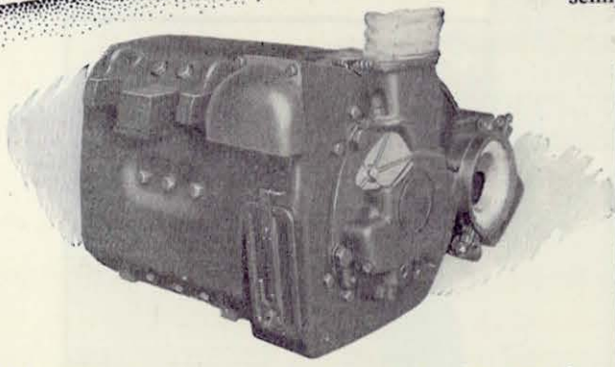
ARMCO CULVERT MANUFACTURERS ASSOCIATION

Middletown, Ohio

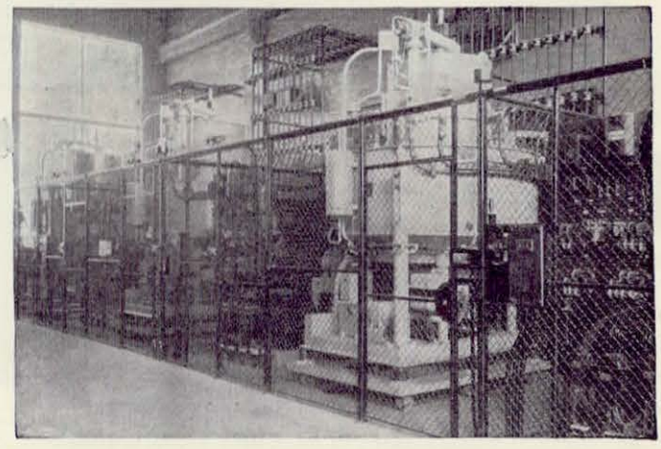
The LACKAWANNA



Each motor car has four motors totaling 940 horsepower and is semipermanently coupled to a trail car. The combined seating capacity of a two-car unit is 164 passengers



This 3000-volt, d-c. motor, developing 235 hp., was designed especially for the D. L. & W. electrification. It is the lightest motor of its type and capacity ever built



The D. L. & W. has installed 3000-volt, d-c. substations using 18 G-E mercury-arc rectifiers, which range in capacity from 1500 to 3000 kw. each, or a total of 40,000 kw. These units have an overall efficiency (a-c. to d-c.) of 97 per cent. G-E high-speed circuit breakers provide superior protection on all feeders in substations and tie stations

Two G-E 124-ton, 3-power, freight locomotives were also supplied—the first of their type (3000-volt) in the world

JOIN US IN THE GENERAL ELECTRIC PROGRAM, BROADCAST EVERY SATURDAY EVENING ON A NATION-WIDE N.B.C. NETWORK

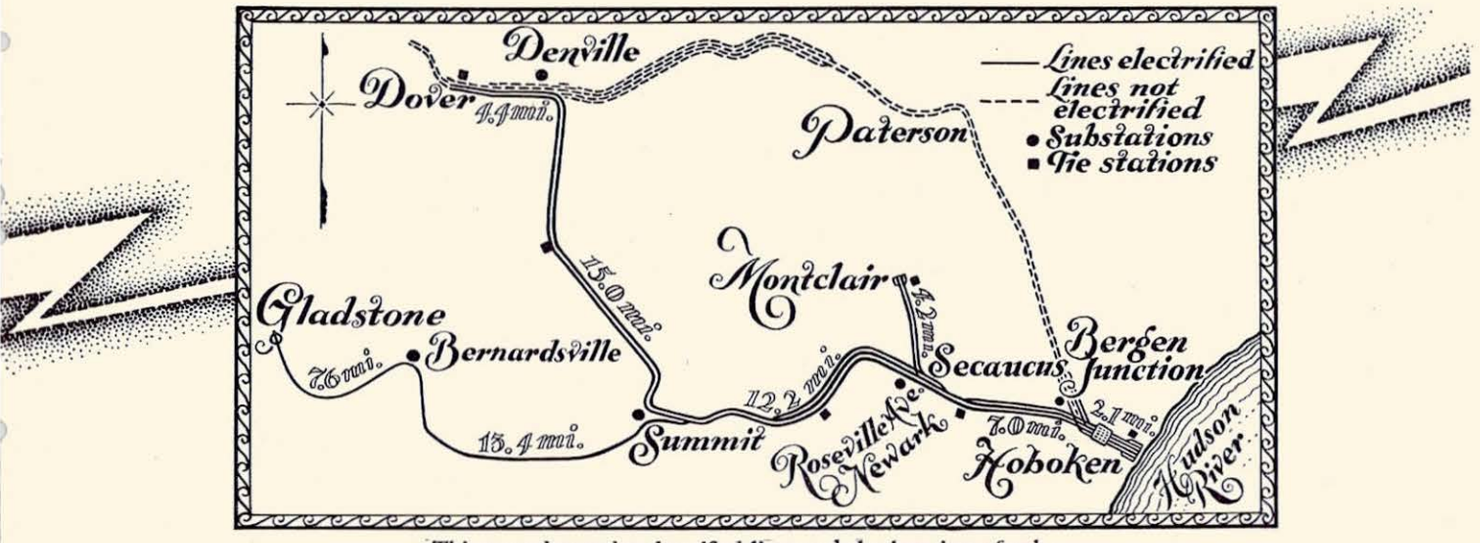
GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

ELECTRIFICATION

FIRST USE OF 3000-VOLT, D-C., MULTIPLE-UNIT CARS ON A LARGE SCALE

MAJOR ALL-RECTIFIER 3000-VOLT ELECTRIFICATION



This map shows the electrified lines and the location of substations and tie stations. The electrified route-miles are 70; the track miles are 160

THE D. L. & W. electrification stands out as one of the most important engineering achievements in recent years. It is the first in the United States to utilize 3000-volt, direct-current, multiple-unit cars, and the first in the world to use this type of equipment on a large scale. The complete dependence on mercury-arc rectifiers for power supply also is indicative of the progressive spirit which has characterized the project from its very beginning.

In supplying the motive equipment, General Electric coöperated with Lackawanna engineers in the design and manufacture of the lightest-weight, 3000-volt, traction motors and control equipment ever built for such heavy service.

The Lackawanna electrification employs 141 motor cars with 141 trailers, and provision is made to operate six motor-trailer units in a twelve-car train. This equipment totals 133,000 horsepower and replaces 120 steam locomotives or 180,000 horsepower. With electric operation, the running time on suburban routes has been materially reduced.

350-91

ELECTRIC

SALES AND ENGINEERING SERVICE IN PRINCIPAL CITIES

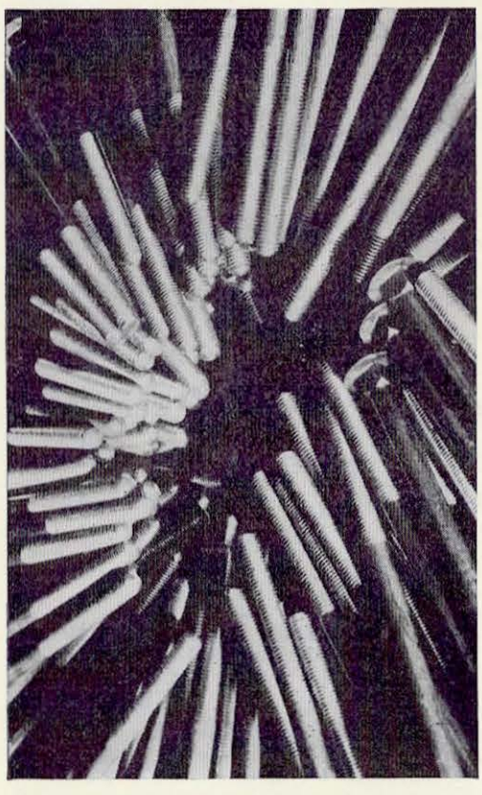
"MAKE THOSE ENGINES LIGHTER"..

...so they even hollow-drilled the bolts

"ELIMINATE all possible excess weight," was the order received by the engineers of a famous airplane engine manufacturer.

Weight *was* eliminated. They even drilled holes in the barrels of the bolts to make them lighter, reaching the minimum weight compatible with the necessary strength.

These hollow-drilled bolts, excellent examples of engineering skill, made the famous engine lighter and thus contributed to greater efficiency. They were strong and they were light; made of a high-grade, special alloy steel. They were a distinct credit to the intelligence and craftsmanship of eminent airplane engine designers and machinists.



Cost was not a primary consideration. These bolts were expensive because of the high cost of drilling the hole vertically through the head and barrel of each bolt. The work was done slowly, carefully, in the engine company's own machine shop.

The bolts cost 64 cents apiece, and eleven of them were used to bolt every engine together.

ONE day, an R B & W salesman called at the airplane engine factory. He believed he might be able to save the company money on engine bolts, and took one of the 64-cent bolts to the R B & W Engineering Service Department.

After a consideration of the problem, the salesman was able to sell the engine makers a standard R B & W Bolt, without the expensive drilled hole, which possessed these outstanding advantages:

1. It weighed only half as much as the former drilled-barrel bolt.

2. It possessed greater strength than the drilled-barrel bolt.

3. It cost 4 cents, instead of 64 cents, a not unwelcome saving.

Since 1845 R B & W has been amassing specialized knowledge of bolt and nut usage and requirements in all branches of industry. If you have a bolt or nut problem, or think there is a possibility of improving your present practices, we probably have the answer already worked out for a similar problem elsewhere.

Executives, engineers, shop men and purchasing agents are invited to write us about their bolt and nut requirements. No obligation.

RUSSELL, BURDSALL & WARD BOLT & NUT CO.

PORT CHESTER, N. Y. ROCK FALLS, ILL. CORAOPOLIS, PA.

SALES OFFICES AT

Philadelphia Detroit Chicago San Francisco Los Angeles Seattle Portland, Ore.

R.B.&W. EMPIRE BOLTS & NUTS

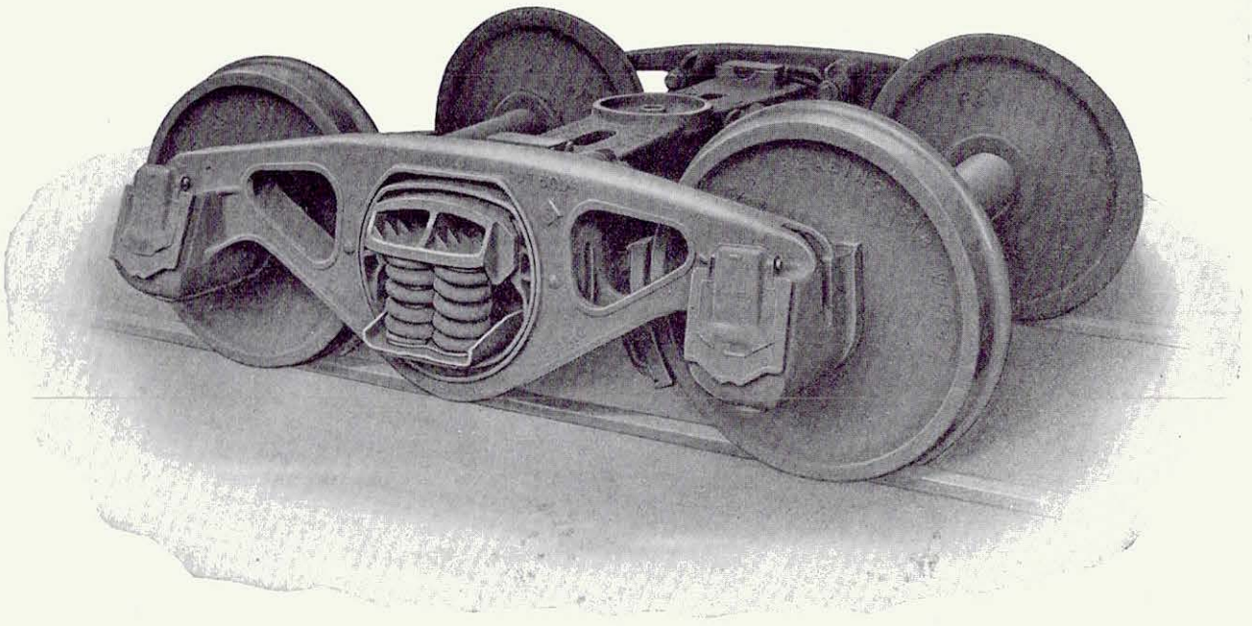
TAYLOR FLEXIBLE TRUCKS

CHECK this truck with any other and the more closely you examine its construction, the more carefully you check its service, the more definitely you will conclude that it offers greater truck value than other trucks on the market today.

Because of mechanical flexibiliy it offers greater safety. It reduces effect of vertical impact, lessening the stresses and producing an easier riding truck.

An important feature is, lower flange wear on wheels and greatly reduced flange pressure on curved rail, resulting in lower train resistance and consequently reduces cost per ton hauled. This has actually been found in service as records show.

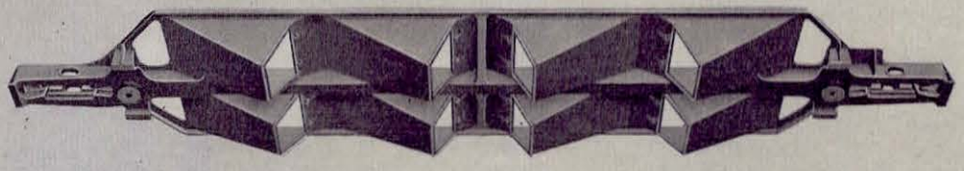
Lower horizontal thrust due to the ability of the wheels on either side of the truck to adjust themselves to the inner and outer rails independently of the opposite side, thus flange drag is reduced.



FLEXIBLE TRUCK CORPORATION

314 GANSTER BUILDING READING, PA.

Commonwealth
CAST STEEL HOPPER CAR UNDERFRAME
With Integral Hoppers



Commonwealth Hopper Car Underframe combines in a single steel casting the complete underframe of car including hoppers which—

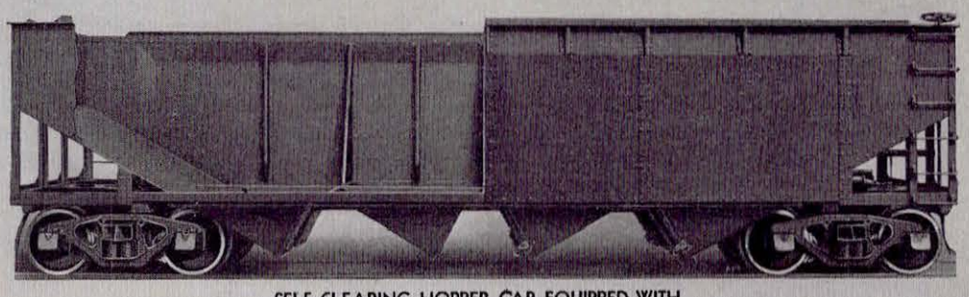
Provides greatly increased strength.

Resists corrosive effect of coal and other sulphurous material.

Eliminates repairs and maintenance.

Increases number of car miles in revenue service.

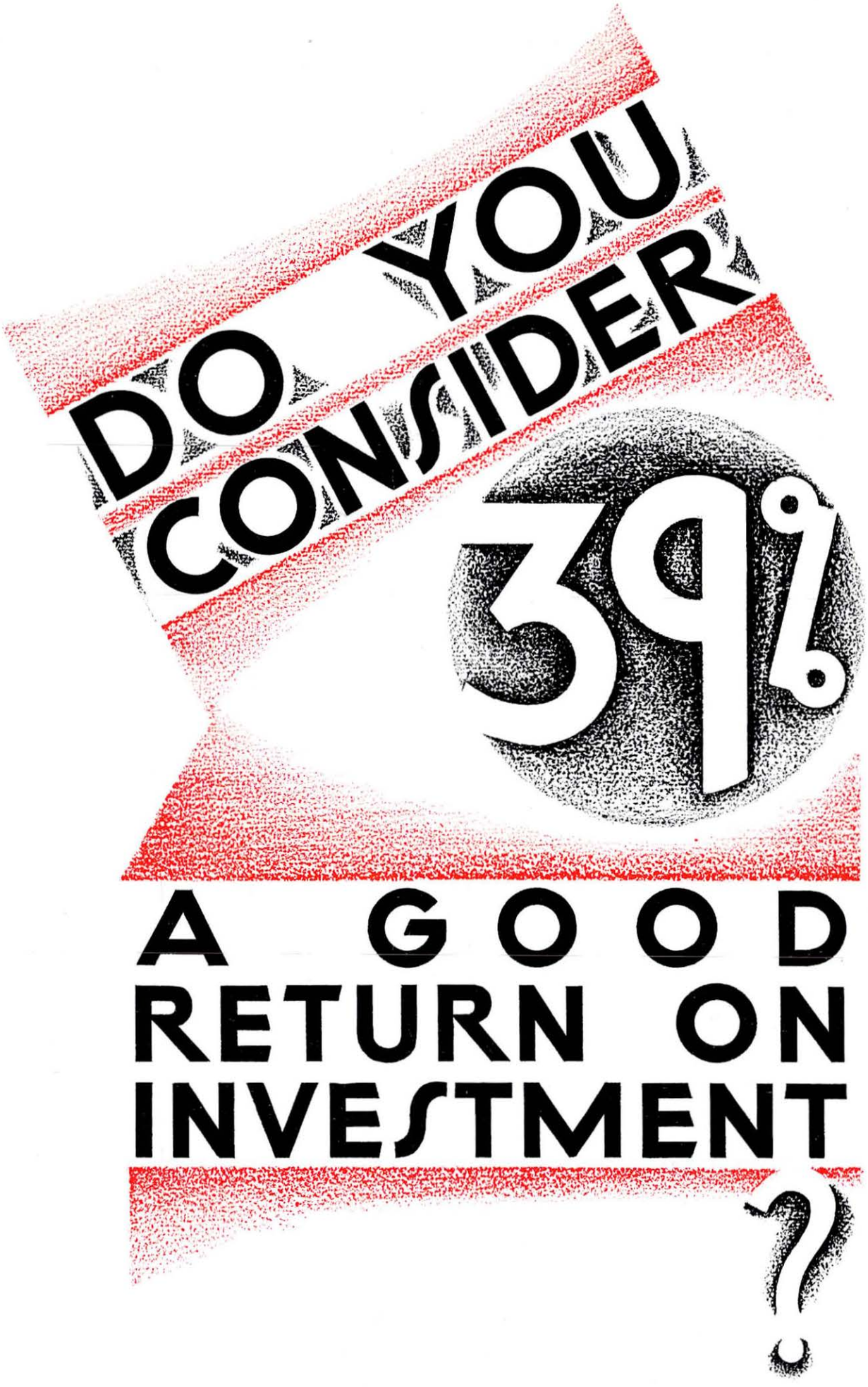
Commonwealth Cast Steel Underframes are designed for all types of cars and are an excellent investment.



SELF-CLEARING HOPPER CAR EQUIPPED WITH COMMONWEALTH UNDERFRAME

GENERAL STEEL CASTINGS CORP.

GRANITE CITY, ILL. *EDDYSTONE, PENN.*


DO YOU CONSIDER
39%
A GOOD RETURN ON INVESTMENT
?

PERHAPS an INVESTMENT OF $380,600 WOULD PAY YOU 39% AS IT DOES ONE PROMINENT ROAD*

Just how profitable IS rail car operation?

A certain railroad purchased eight Electro-Motive Cars at a cost of $380,600.00

Over a period of 41 months' operation, on the basis of steam train costs at 80c per mile and actual motor car costs, at 38c per mile, (including fixed charges), the road has saved $12,390 per month, a total to date of $508,00.00

THUS, AN INVESTMENT IN ELECTRO-MOTIVE CARS IS YIELDING THIS ROAD AN ANNUAL RETURN OF 39%.

This is but one of a number of roads on which Electro-Motive Car operation is proving highly profitable. Perhaps you have equal possibilities for saving with Electro-Motive Cars.

More traffic is carried in Electro-Motive Cars than in all other types of gas-electric cars combined.

* Name of road on request.

THE ELECTRO-MOTIVE COMPANY

CLEVELAND . . . . . OHIO

SUBSIDIARY

GENERAL MOTORS CORPORATION

NEW YORK Graybar Bldg. | CHICAGO Peoples Gas Bldg. | ST. LOUIS Railway Exchange Bldg. | SAN FRANCISCO Rialto Bldg.

GAS-ELECTRIC | **MOTOR CARS LOCOMOTIVES POWER PLANTS** | **GAS-ELECTRIC**

CHILLED TREAD WHEEL HISTORY

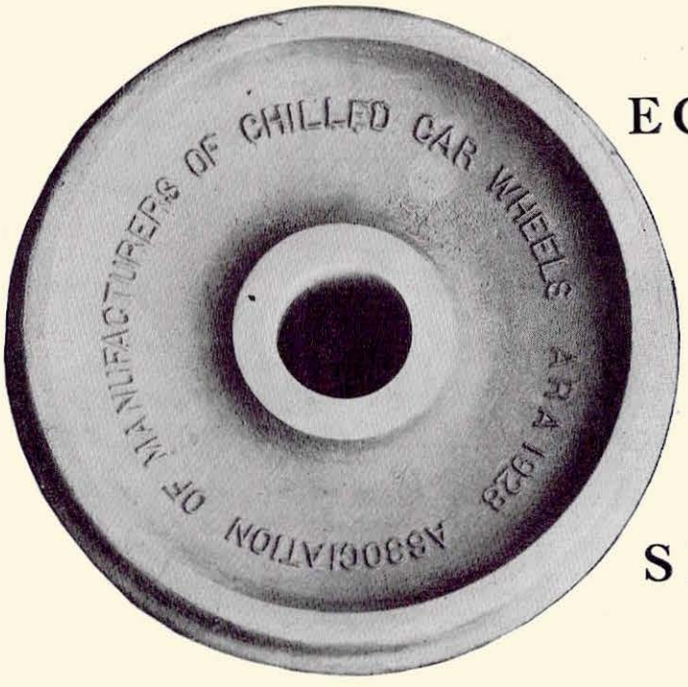
1838 —Special designs of **Chilled Tread Wheels** Pat. by Truscott, Wolf and Dougherty—H. R. Dunham.
1850 —Double Plate Design **Chilled Tread Wheel**—Pat. by Ntl. Washborn.
1884 —Five Million **Chilled Tread Wheels** in Service.
1914 —Twenty Million **Chilled Tread Wheels** in Service.
1917-20—Arch Plate Design Double Plate **Chilled Tread Wheel** adopted as A.R.A. Standard.
1928 —Single Plate Design **Chilled Tread Wheel** adopted as A.R.A. Standard.
1930 —Twenty-Four Million **Chilled Tread Wheels** in Service.

The wonderful development of transportation facilities has been made possible by the Chilled Tread Car Wheel.

Better Every Year

A slogan and a fact based upon definite laboratory and foundry programs.

The New Single Plate
Chilled Tread Wheel
with re-inforced flange
Over
Five million now
in service with
an unexcelled
service record



ECONOMY

SAFETY

SERVICE

FOR THE 70-TON CAR THE 850-LB. CHILLED TREAD WHEEL—THE HEAVIER THE CAR CAPACITY THE GREATER THE FACTOR OF SAFETY.

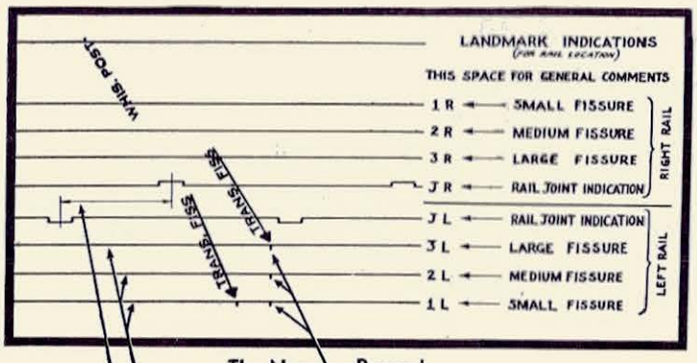
CHILLED TREAD WHEELS

A. R. A. Standards

650-lb. for 30-ton Cars—700-lb. for 40-ton Cars—750-lb. for 50-ton Cars—850-lb. Wheel for 70-ton Cars

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
1847 McCORMICK BUILDING, CHICAGO, ILLINOIS

GREATER ACCURACY in Rail Testing *with this* IMPROVED RECORD TAPE



The New Record

THE research and experimental work which preceded the final perfecting of the first Sperry Detector Car is still being carried on. Simplification, improvements in equipment and an even higher degree of accuracy are constantly being sought.

Recent developments in the Sperry Laboratory have resulted in a greatly improved record tape with which each Detector Car of the Sperry Fleet is now equipped. Increased accuracy in testing results for the following reasons:

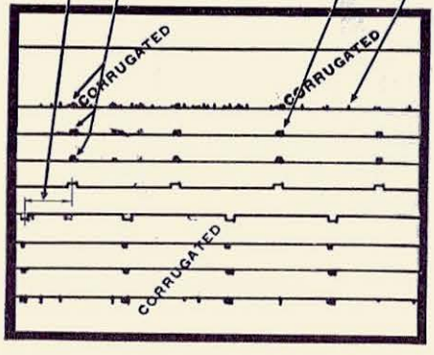
1. **LARGER SCALE AND FINER LINES** (1/16" = 1') — permit separate indications where defects are close together, greatly clarifying the record.

2. **JOINT INDICATIONS**—are now automatically eliminated in the new record, further simplifying the record.

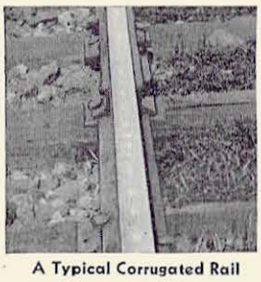
3. **FISSURES CLOSE TO JOINTS**—The chance of confusion is removed because indications are now clearly shown separately from joint indications.

4. **WHEELBURNS, CORRUGATIONS,** etc., of a minor nature are now eliminated from the record. Large defects are easily recognized and marked so on the record.

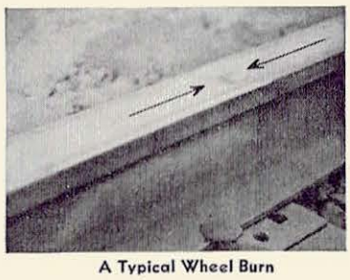
The Old Record



Constant improvements, of which the new record tape is a typical example, are being incorporated in Sperry Detector Cars right along. This procedure is an assurance to railroads of more accurate results from tests by Sperry Rail Service. It is an advantage made economically possible by the contract basis on which all Sperry tests are conducted.



A Typical Corrugated Rail



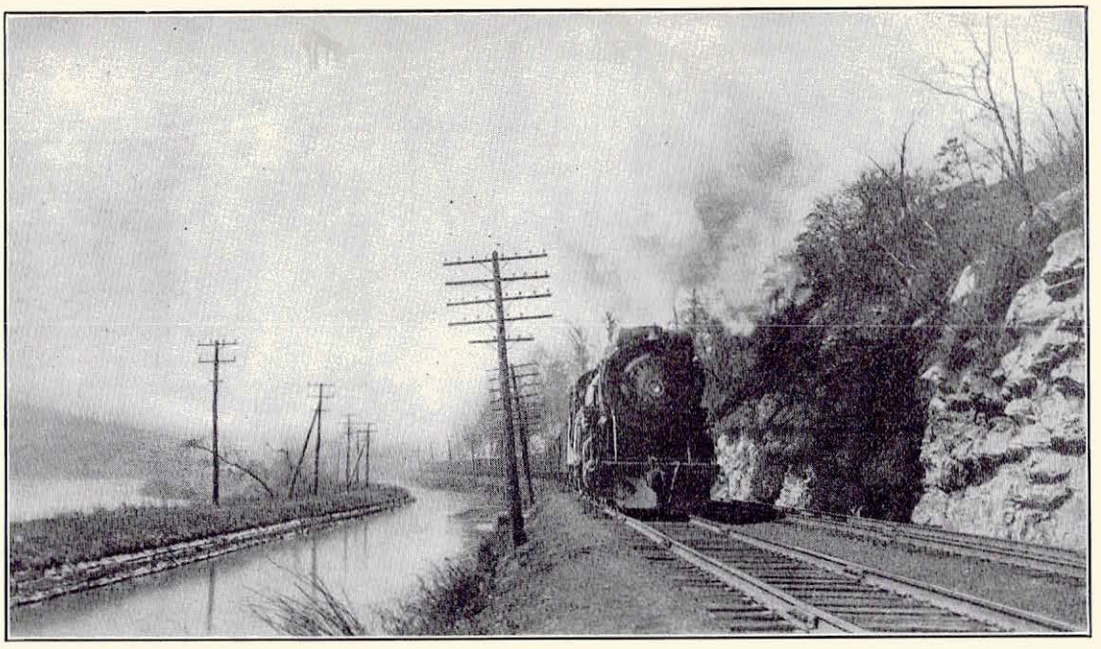
A Typical Wheel Burn

SPERRY RAIL SERVICE

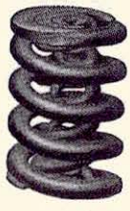
SPERRY PRODUCTS, INC.

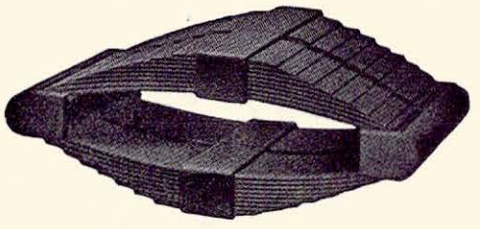
Sperry Building, Manhattan Bridge Plaza, Brooklyn, N. Y.

Chicago Office: 80 East Jackson Blvd.



Springs That Are An Economy—Not An Expense





Railroad men appreciate the importance of superior springs for locomotives and cars. If springs should lack resilience, the smooth riding qualities are impaired. If they fail in service, passengers, lading and equipment are endangered. If they require replacement before their time, they are a source of expense which eats into legitimate profits.

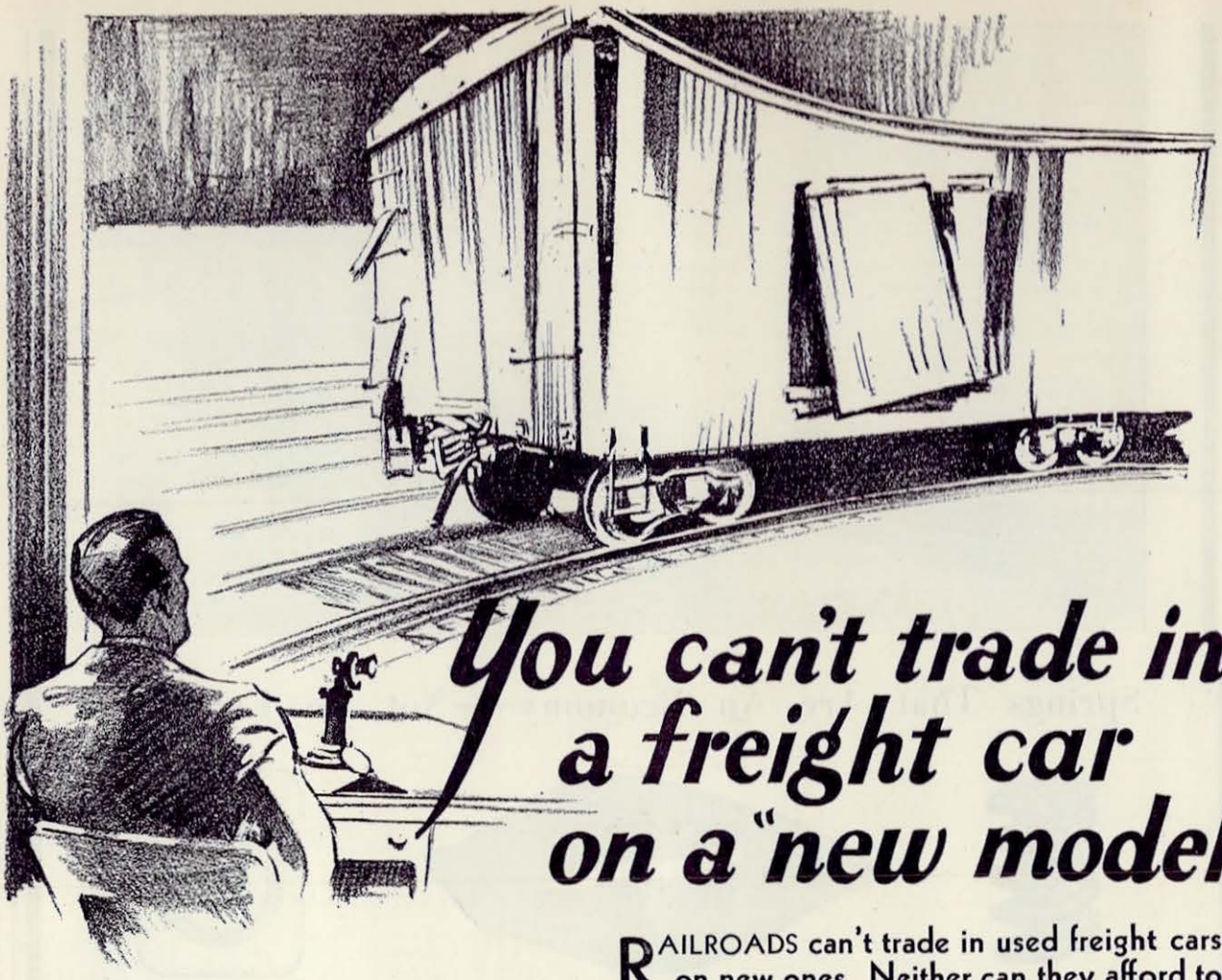
Experienced railroad operatives, therefore, are demanding the high performance, dependability and economy of Railway Steel Springs. Made and designed by specialists of long experience, they are noted for their enduring resiliency, durability and freedom from premature failure, resulting in decreased operating costs.

Railway Steel-Spring Company

30 CHURCH ST., NEW YORK

Branch Offices:

Chicago, Ill.	Detroit, Mich.	Richmond, Va.	Pittsburgh, Pa.	Montreal, Que.
St. Paul, Minn.	Dallas, Texas	St. Louis, Mo.	Denver, Colo.	San Francisco, Cal.
		Cleveland, Ohio		

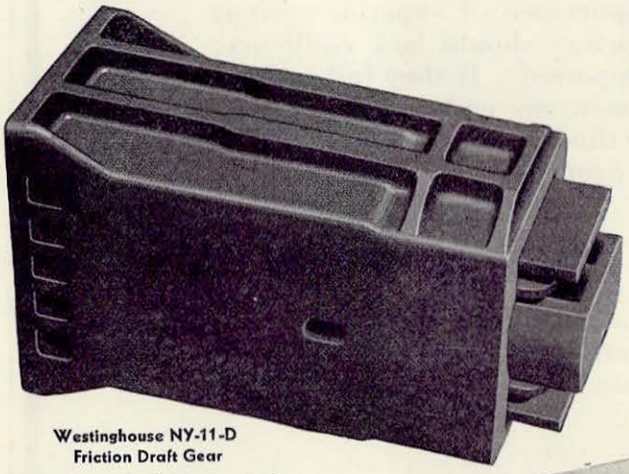


You can't trade in a freight car on a "new model"

RAILROADS can't trade in used freight cars on new ones. Neither can they afford to discard freight cars after three or four years and replace them with the modern, newer, stronger, heavier cars.

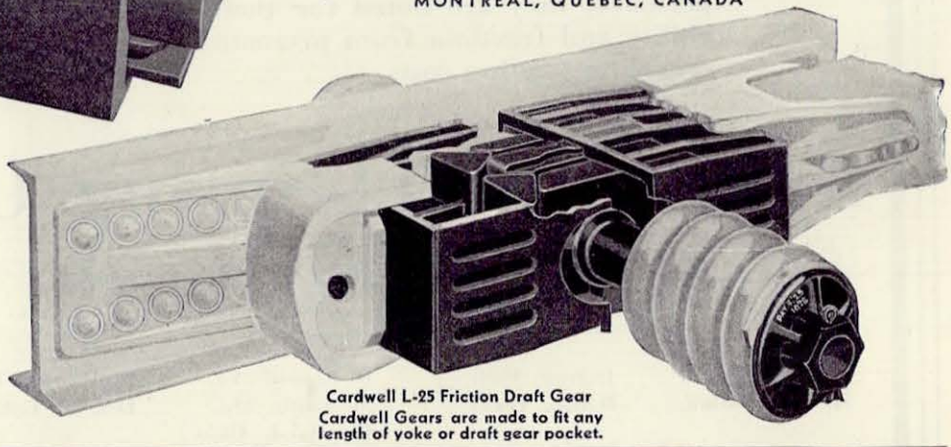
Give these lighter cars the increased protection they need by replacing inadequate draft gears with Cardwell or Westinghouse Draft Gears.

CARDWELL WESTINGHOUSE CO.
332 S. Michigan Avenue, Chicago, Ill.
PITTSBURGH, PENNSYLVANIA
MONTREAL, QUEBEC, CANADA



Westinghouse NY-11-D Friction Draft Gear

Westinghouse Draft Gears can be applied with any type of attachments.



Cardwell L-25 Friction Draft Gear

Cardwell Gears are made to fit any length of yoke or draft gear pocket.

Cardwell and Westinghouse Draft Gears

Are made in sizes and capacities to meet all modern and A. R. A. requirements for locomotives, freight and passenger cars.

GOOD DRAFT GEARS MAKE CARS GO FARTHER

FRESH MILK

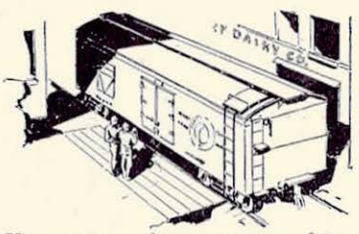
a Change in Definition

The "milk problems" of the past exist no longer. Gone is the danger of impure, unwholesome milk . . . taken from "city-lot" cows or shipped from the country in cans that were sometimes carelessly washed. The milk-man's high cart and clanging bell belong to a forgotten tradition.

Today milk comes to our tables as sweet and fresh as when it left the farm . . . which is sometimes many hundreds of miles away. Specially constructed glass-lined refrigerated milk cars enable it to be shipped great distances without any loss of its purity and richness.

This change in the definition of milk is indicative of the constant advancement of railroad transportation, in which General American has played so important a part. It has built, designed or invented hundreds of cars . . . milk, refrigerator, tank, express, stock and others.

It has perfected a transportation service that extends from coast to coast . . . a service that includes ten repair plants and a vast fleet of cars which it leases to shippers throughout the country. It also operates a large export terminal for the storage, handling and packaging of all kinds of bulk liquids—and, in addition, maintains an extensive European freight transportation system. Its vast resources and manifold activities make it the largest organization of its kind in the world.



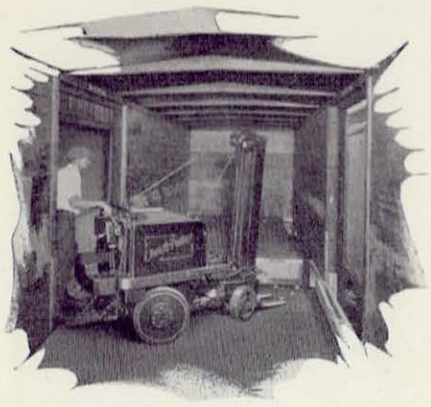
No matter what you are shipping, you will find it profitable to confer with our engineers. Railroad transportation is always dependable—a railroad car can be built to carry any commodity in bulk. Write or wire, Continental Illinois Bank Building, Chicago.

GENERAL AMERICAN TANK CAR CORPORATION

"a railroad freight car for every need"

THIS ADVERTISEMENT APPEARS IN MARCH ISSUES OF NATIONAL MAGAZINES TELLING EXECUTIVES SOMETHING ABOUT OURSELVES AND STRESSING THE FACT THAT "RAILROAD TRANSPORTATION IS ALWAYS DEPENDABLE."

How to make Freight Terminals show a Bigger Profit



A full discussion of skid handling. Our new booklet, "Handling And Shipping On Skids" contains much information that will interest the terminal official. 16 pages. Illustrated with 75 photographs. Your copy is free. Send for it. No obligation.

HANDLING is the major operation in freight terminals. With no raw material or manufacturing costs to consider, handling expense probably forms a greater proportion of total cost in freight terminals than in any other line of business.

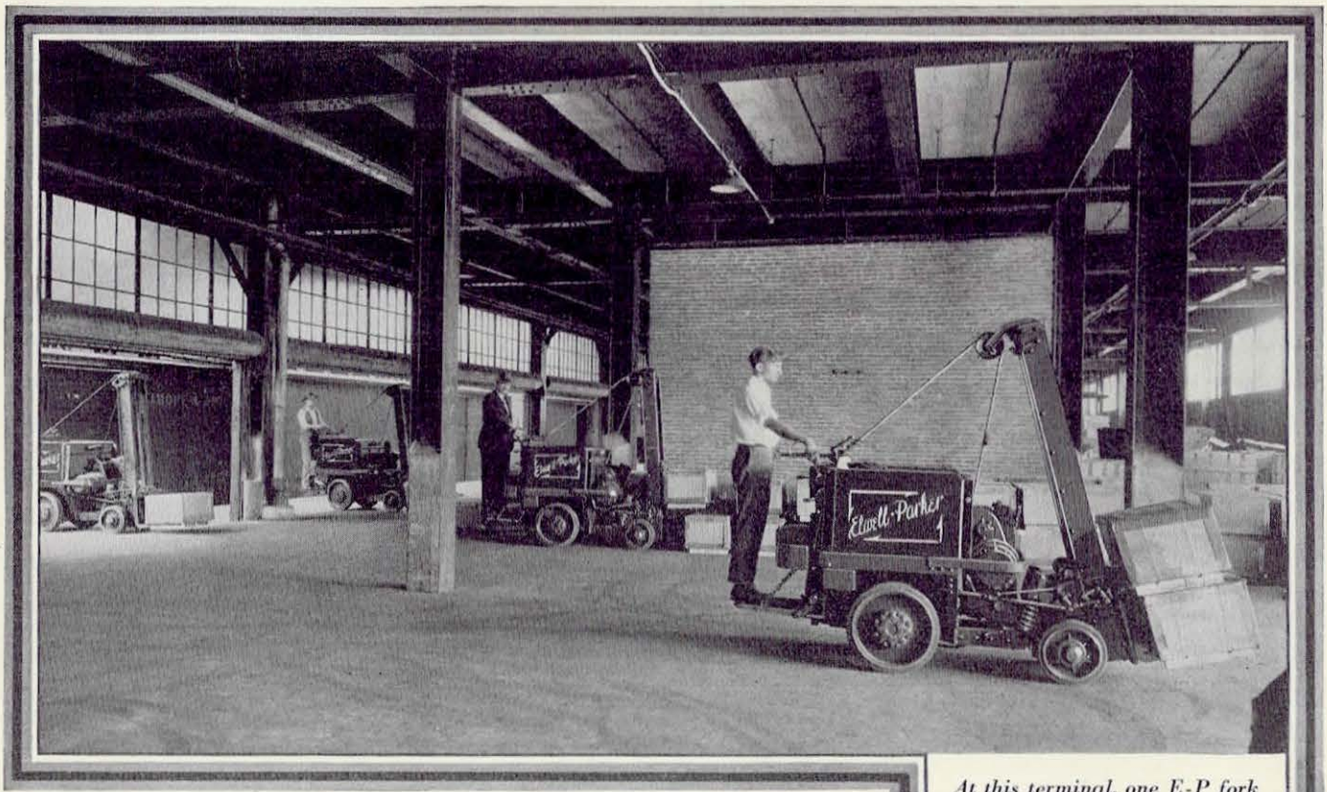
Reducing the cost of handling therefore is a sure and quick way to make terminals earn their share of profits.

The most elementary study of costs will show that freight handling expense can be greatly reduced when bigger unit loads are moved at a greater rate of speed. In hundreds of terminals, and in thousands of industrial plants, electric power trucks have proved best for this purpose.

Elwell-Parker electric trucks are flexible to go where hand trucks will go. One man on an Elwell-Parker electric truck can pick up a skid or heavy piece ranging in weight from one to five thousand pounds, transport it 500 feet per minute and stack it if necessary. With a hand truck, 250 pounds is heavy for a man to handle and it would be hard work to move it 150 feet per minute.

Such savings need no explanation. The tremendous value of electric trucks in freight handling has been proved again and again and the savings resulting from their use begin to show up immediately in terminal profits. Reduced costs in most cases will defray the initial expense during the first year of operation.

Elwell-Parker is ready and willing to submit drawings and specifications of the proper truck to fit the conditions of your terminal. Get in touch with your nearest Elwell-Parker Field Engineer for a survey or write direct to Elwell-Parker, 4250 St. Clair Avenue, Cleveland, Ohio.



At this terminal, one E-P fork truck unloads 35-ton car of tin plate in 40 minutes. Costs have been reduced 50%. Trucks used continuously on all commodities.

ELWELL-PARKER

DESIGNERS AND BUILDERS OF ELECTRIC INDUSTRIAL TRUCKS, TRACTORS AND CRANES FOR OVER A QUARTER CENTURY

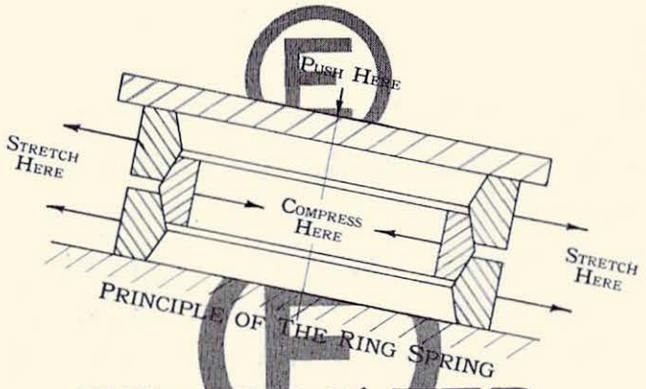
EDGEWATER

Ring Spring DRAFT GEAR

A proved, tested Draft Gear embodying a new mechanical principle—giving equipment protection not heretofore possible.

Bulletin R-4 describes this Ring Spring Draft Gear in detail.

EQUIPMENT PROTECTION *not heretofore possible*



EDGEWATER STEEL CO.

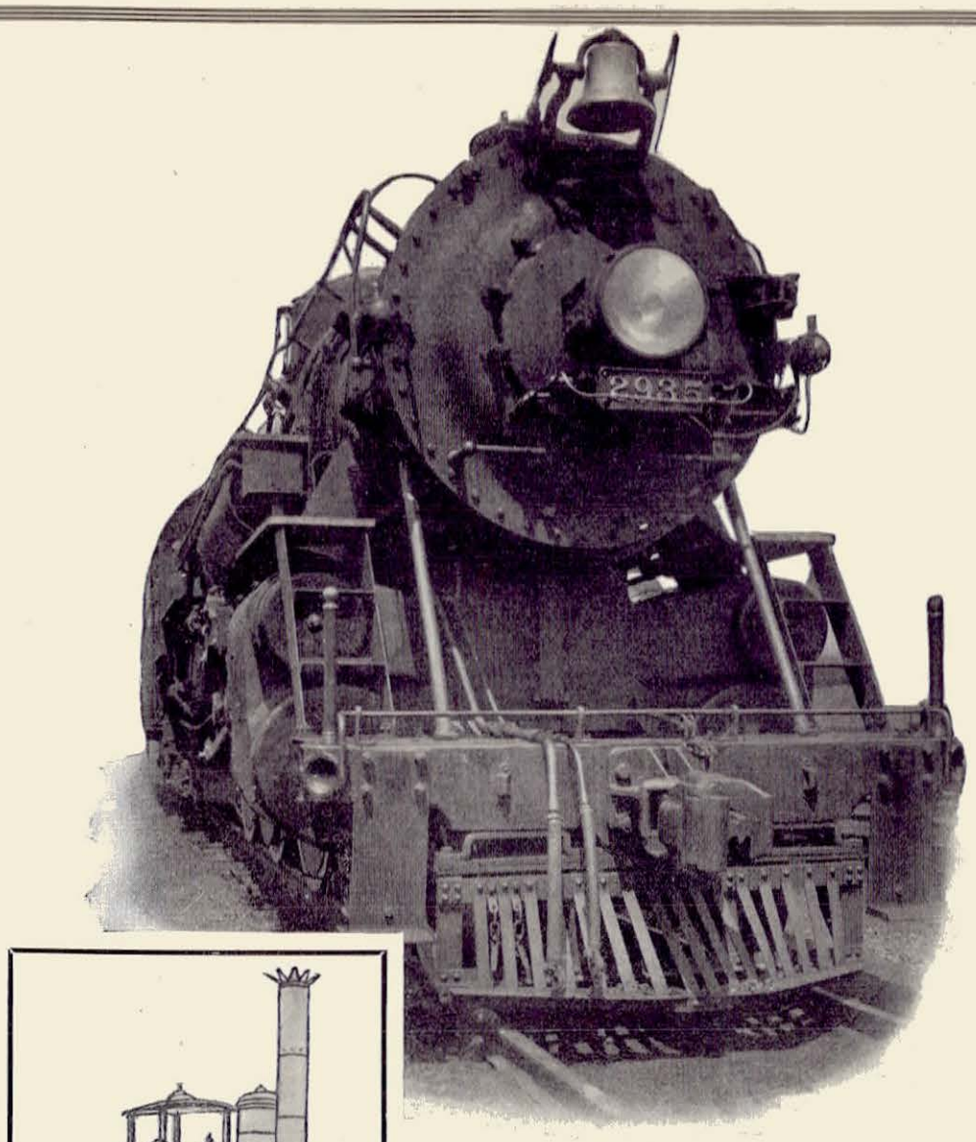
Pittsburgh, Pa.

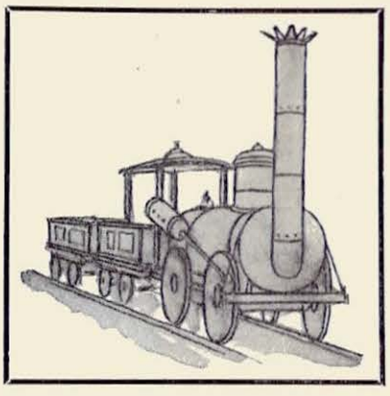
Atlanta, Ga. .....Candler Bldg.
Baltimore, Md. .....Munsey Bldg.
Boston, Mass. .....53 Oliver St.
Chicago, Ill. .....Peoples Gas Bldg.
Louisville, Ky. .....Starks Bldg.

SALES OFFICES

New York, N. Y.
Grand Central Terminal
Philadelphia, Pa.
Commercial Trust Bldg.
Portland, Ore. ...114 North 16th St.

San Francisco, Cal. ..540 Brannan St.
St. Louis, Mo. ..Rwy. Exchange Bldg.
St. Paul Minn. Merchants Bank Bldg.
Seattle, Wash., 2929 First Ave., South
Washington, D. C. ....Munsey Bldg.





It has taken many years to accumulate the experience which is embodied in every "Standard" part. This experience has grown with the industry. It cannot be seen or felt, weighed or measured. But its results are found in the inherent worth and long life of every product produced by "Standard."

STANDARD STEEL WORKS COMPANY

GENERAL OFFICES & WORKS: BURNHAM, PA.

CHICAGO
NEW YORK
PHILADELPHIA

ST. LOUIS
RICHMOND

AKRON
PORTLAND
SAN FRANCISCO

Dearborn Has Earned The Right

Correcting Boiler Water Troubles Scientifically

Dearborn Treating Plants

Controlling Corrosion in Circulating Systems

Cleaning Out Scaled Equipment

NO-OX-ID Rust Preventive

Efficient Cleaning Compounds

During its unbroken record of 44 years of scientific service to industry, the Dearborn Chemical Company has developed complete correction of boiler water troubles at costs far lower than by other methods. The roster of railroad and manufacturing companies for whom we work reads as a blue book of American and World industry. The fact that 1930 was the greatest in quantity of Dearborn products supplied to industry, reveals how essential they are.

In serving well, for all these years, in creating fundamental economies, in supplying essential scientifically effective products, Dearborn has earned the right to be called in council wherever problems arise in the use of steam for power production.

The Dearborn Chemical Company was the pioneer in specialization in the field of scientifically correcting harmful tendencies in the waters used for making steam. It has carried the science of treating waters far beyond the conceptions and abilities of the unspecialized. The Dearborn method of analyzing the water and supplying the materials essential for correction of the harmful tendencies disclosed, eliminates uncertainty and makes Dearborn Treatment completely effective.

The treatment of boiler water by the application of small quantities of properly adjusted chemicals directly to the feed water, produces this complete control of water troubles with respect both to economical and efficient steam production.

Associated problems have been presented to us from time to time and have been solved through research in Dearborn Laboratories. The services developed are here tabulated. They are in general use, practically as widely distributed as Dearborn Treatment. As with Dearborn Treatment, each is worthy of your careful consideration on the basis of its well established effectiveness and economy.

Consult with the Dearborn representative who calls on you or write us.

DEARBORN CHEMICAL COMPANY

310 S. Michigan Avenue, CHICAGO 205 E. 42nd Street, NEW YORK
Canadian Office and Factory: TORONTO

See our exhibit at the Railway Engineering Association Convention Coliseum, Chicago, Mar. 10-12

Dearborn
TRADE MARK REGISTERED

SYPHONS Increase Boiler Efficiency 8.58%

"At all rates of evaporation, the Syphon-equipped locomotive showed a definite and noticeable superiority over non-Syphon engine as regards both evaporation per pound of coal and boiler efficiency."

Bulletin No. 220, University of Illinois, contains complete records of the tests.

Increased Circulation

Unfailing Safety

Reduced Boiler Maintenance

Increased Economy

THERMIC SYPHON MAY SAVE RAILS $25,000,000

Believed Annual Saving on 40,000 Engines; Efficiency Up 8.5 Pct.

from the financial page

THE CHICAGO DAILY NEWS

Wednesday Feb. 4, 1931

A possible saving of $25,000,000 annually in the operation of 40,000 of the larger type of locomotives on American and Canadian railroads may be realized through the use of the thermic syphon, a device applied in the fire boxes of locomotives to stimulate the circulation of the water within the boiler and to accelerate the transmission of heat from the coal to the steam. This is the conclusion drawn from the results of tests made on an Illinois Central locomotive at the University of Illinois. Locomotive Firebox Company of Chicago also co-operated in the experiments.

Through use of the thermic syphon, a gain of eight and one-half per cent in locomotive efficiency is possible, according to the experiments. In other words, about eight and one-half per cent more steam per pound of coal is evaporated in the boiler of the syphon-equipped locomotive than in the boiler of the nonsyphon locomotive. In other respects locomotive performance is substantially the same in either case. Tests were made at four different rates of operation, representing about the range of performance of the locomotive in service.

Used Eight-Drive Freighter.

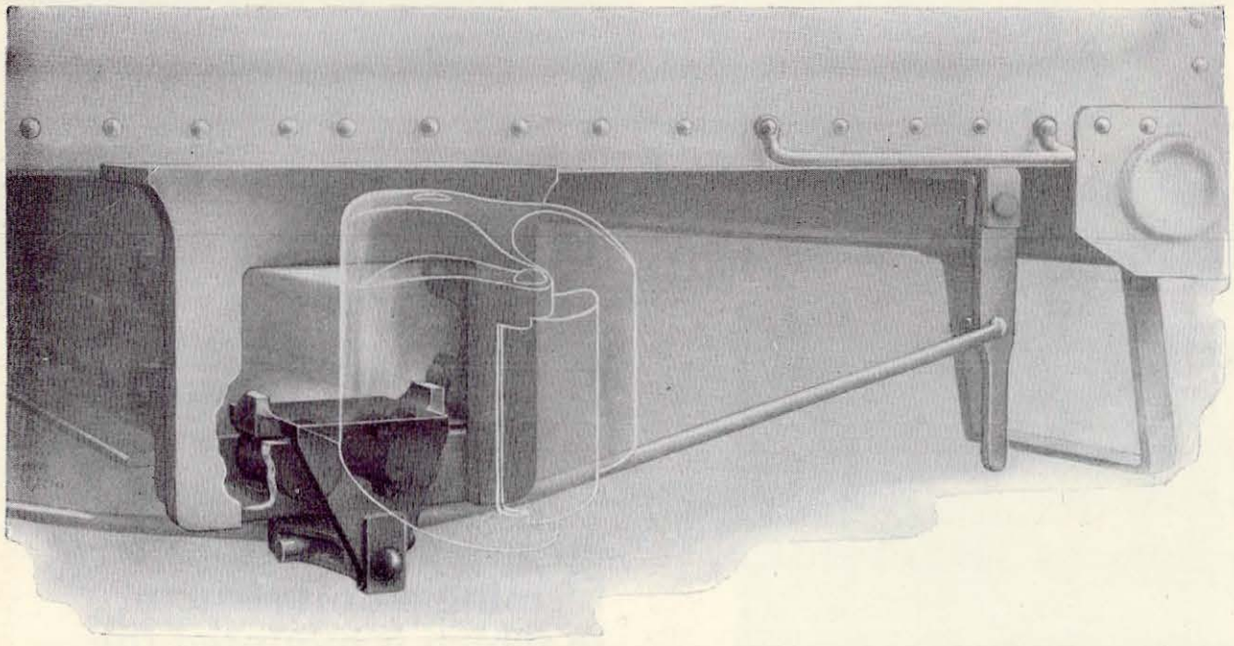
Investigations were carried on in the university's locomotive laboratory on an eight-driver freight engine under conditions exactly the same as those encountered on the railroad. The laboratory permits monstrous locomotives to run at full load and at full speed, if need be, but the drivers rotate on anchored drums, instead of up and down a right of way. While the engine may be pulling a load equal to forty or fifty cars, at a speed of forty miles an hour, it stays in one place.

LOCOMOTIVE FIREBOX COMPANY

NEW YORK CHICAGO MONTREAL

Universal

DRAWBAR ADJUSTER



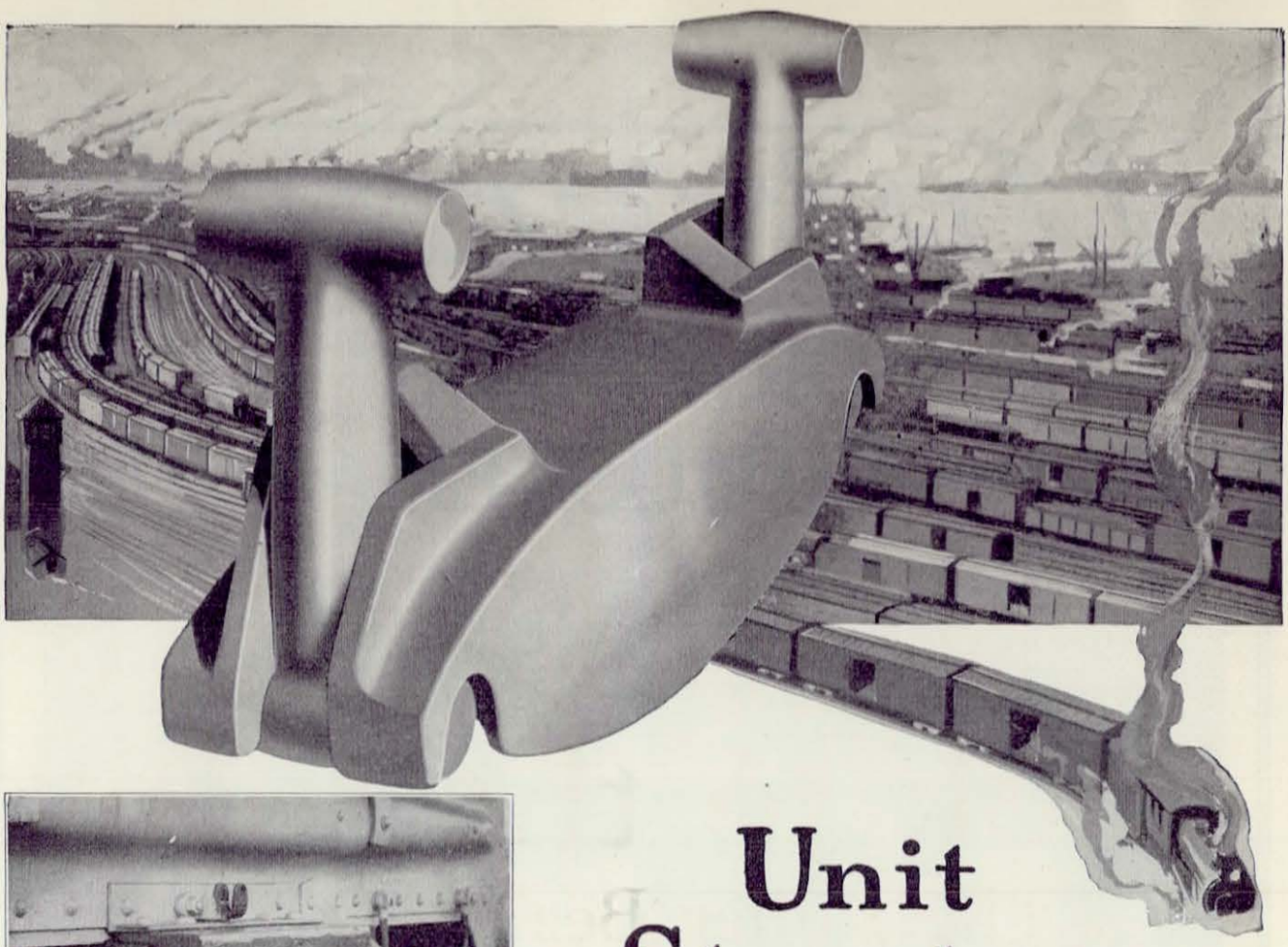
A SAFETY DEVICE

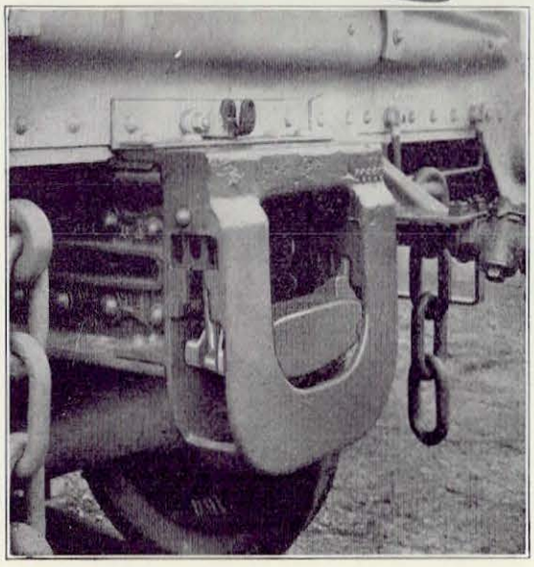
INCORPORATED IN THE A.R.A. BUFFER
OR
U.S.R.A. CARRY IRON

Universal Draft Gear Attachment Co.

332 S. Michigan Avenue, Chicago

Royal Bank Building, Montreal, Canada



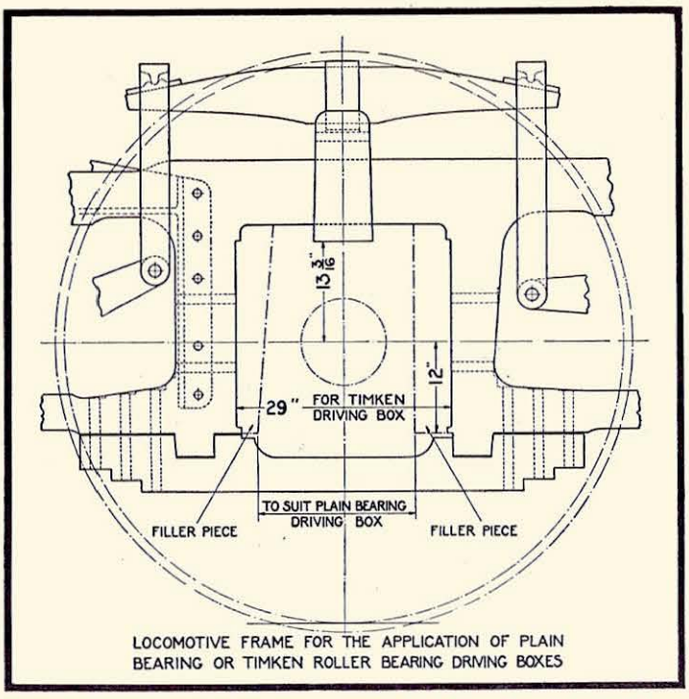


Unit Structure

The striking casting has an integral bottom tie forming a unit structure in which is mounted the swinging Union Centering Device. Together they give the necessary movable coupler support with the solid center sill bottom tie.

UNION METAL PRODUCTS COMPANY

NEW YORK · CHICAGO · ST. LOUIS · WASHINGTON
RICHMOND · HOUSTON · SAN FRANCISCO · KANSAS CITY · MONTREAL



LOCOMOTIVE FRAME FOR THE APPLICATION OF PLAIN BEARING OR TIMKEN ROLLER BEARING DRIVING BOXES

Look to the future

The Roller Bearing Locomotive is a proved success. Design the main frames of your new engines for future Timken Bearing applications

In a few years no locomotive will be considered modern unless it is completely Timken Bearing Equipped, for the performance of the Timken roller bearing locomotive has revealed operating efficiencies and economies that no railroad can afford to ignore.

The Timken locomotive has now gone more than 60,000 miles in fast passenger and freight test service without any bearing difficulty whatsoever.

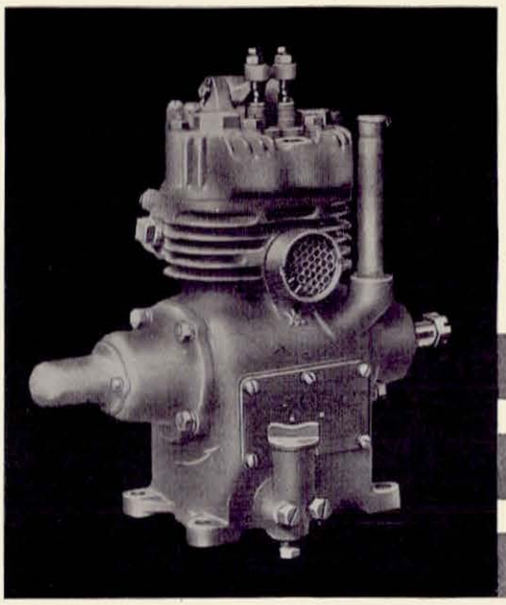
This showing would justify the immediate adoption of Timken Bearings for all locomotive driving axles, but in any case it points to the wisdom of designing your new locomotives so that Timken Bearing axles can be quickly and economically substituted for the plain bearing driving axles when the time is ripe.

All that is necessary is a slight modification in the design of the frames as shown by the accompanying drawing, mainly involving the provision of larger openings for the axles.

Removable filler blocks or thicker shoes and wedges will permit the use of Timken or plain bearing axles at will.

Protect your new locomotives against the threat of early obsolescence by incorporating this feature. The Timken Roller Bearing Company, Canton, Ohio.

TIMKEN *Tapered Roller* **BEARINGS**



MAKING SPEED SAFE
➤➤TRANSPORTATION
SWIFT AND SECURE

Bendix-Westinghouse Automotive Air Brakes offer a perfect balance for modern speed and power. Heavy duty highway transportation, the world over, has been quick to recognize this fact. As a result, modern truck, coach, tractor and trailer systems everywhere are skimming the highways . . . setting and maintaining unprecedented schedule speeds in perfect safety. So effectively have Bendix-Westinghouse Brakes solved the problem of modern control that their steady rise to universal acceptance has been little short of phenomenal . . . and certainly not accidental. Over a half century's experience in the development and manufacture of power braking devices has weighed heavily in the production of today's most perfect braking system. Bendix-Westinghouse representatives in your territory would be pleased to give you more detailed information regarding the countless advantages of the modern power braking system. Their service as well as that of a complete engineering staff will be placed at your disposal. There is no obligation. Merely address your request to the BENDIX-WESTINGHOUSE AUTOMOTIVE AIR BRAKE COMPANY at Pittsburgh, Penna.

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SAFE-SURE TRACTION

LONG MILEAGE

LOW COST

BE PREPARED for wet, icy highways . . . eliminate unnecessary road delays . . . specify Firestone Gum-Dipped Tires, Puncture-Proof Tubes and Firestone Rims when purchasing new equipment. ▼ ▼ ▼ ▼ ▼

Firestone

TRUCK *and* BUS BALLOONS

TIRES ▼ TUBES ▼ RIMS ▼ BATTERIES ▼ BRAKE LINING

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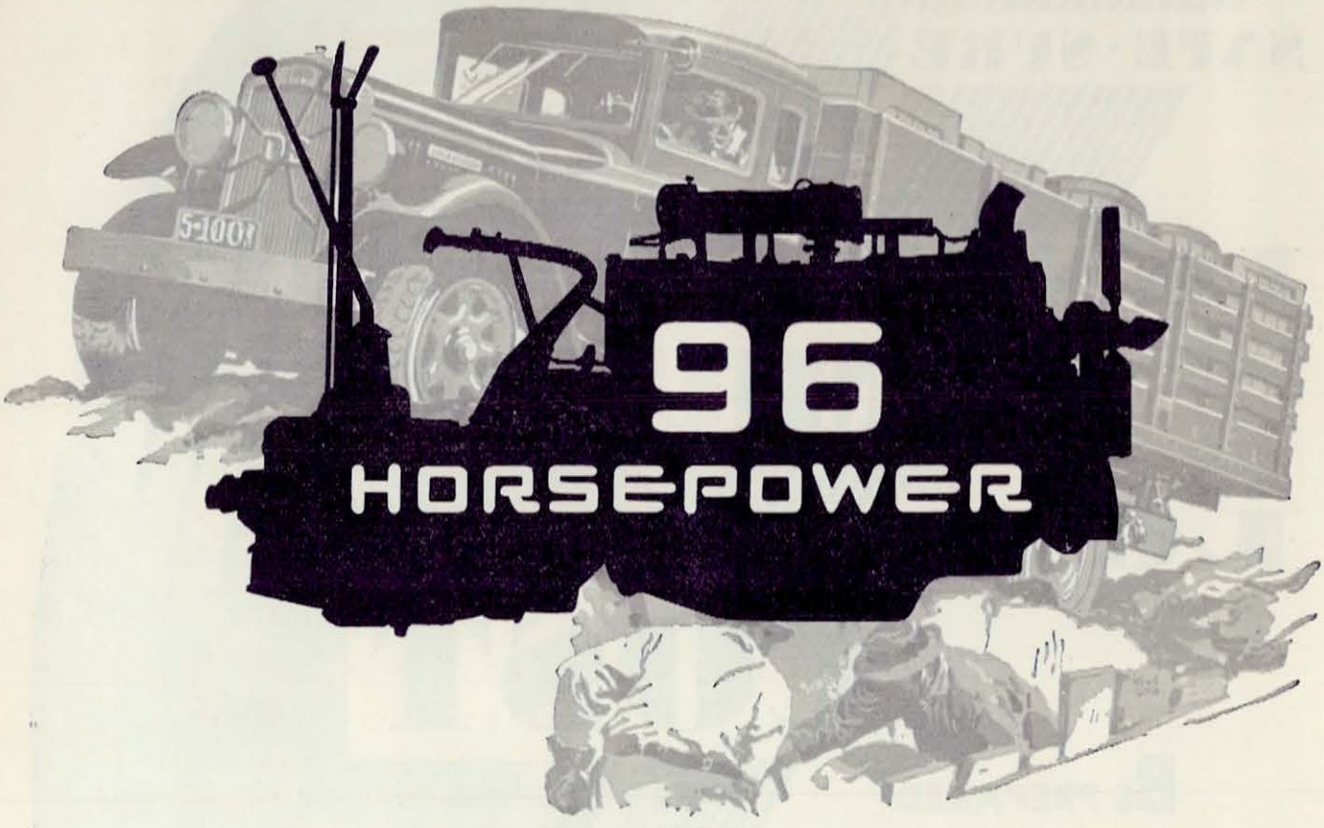


BUILT FOR HEAVY-DUTY HAULING

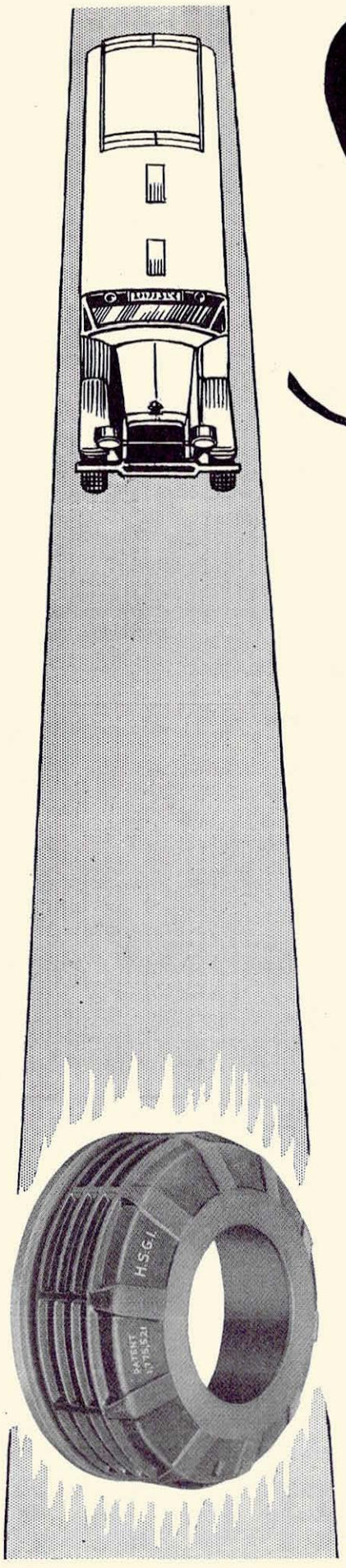
Inspection of their powerful engines, alone, quickly proves how sturdy, how modern, how thoroughly "all-truck" Dodge Heavy-Duty Trucks actually are. And beneath the clean-cut, rugged exterior of one of these 96-horsepower engines are full force-feed lubrication, 100-pound crankshaft, 7 bearings, crankcase ventilator, aluminum-alloy pistons and many other features that insure power, dependability, low cost and long life.

Inspect Dodge Heavy-Duty Trucks—their engines, axles, transmissions, frames, springs. Select the type that fits your needs — payload capacities range from 3,600 to 11,175 pounds. Buy it complete with standard or special body.

THE COMPLETE LINE OF DODGE TRUCKS RANGES IN PAYLOAD CAPACITIES FROM 1,200 TO 11,175 POUNDS—PRICED, CHASSIS F. O. B. DETROIT, FROM $435 TO $2695, INCLUDING 1½-TON CHASSIS AT $595

DEPENDABLE

DODGE HEAVY DUTY TRUCKS



Safe Brakes

THE coach or truck equipped with *Brake Drums* made of HUNT-SPILLER *Air Furnace* GUN IRON can be depended upon to make that "short stop" in all emergencies.

Brake Drums made of HUNT-SPILLER *Air Furnace* GUN IRON will not score under normal conditions—they always retain that smooth service which insures maximum braking efficiency and absolute control.

The wear-resisting properties of HUNT-SPILLER *Air Furnace* GUN IRON solve the problems of cutting, scoring and grabbing and thus eliminate the necessity of constant adjustments and frequent renewals.

Provide Safe Brakes for your drivers this year. Equip every coach and truck with *Brake Drums* made of HUNT-SPILLER *Air Furnace* GUN IRON.

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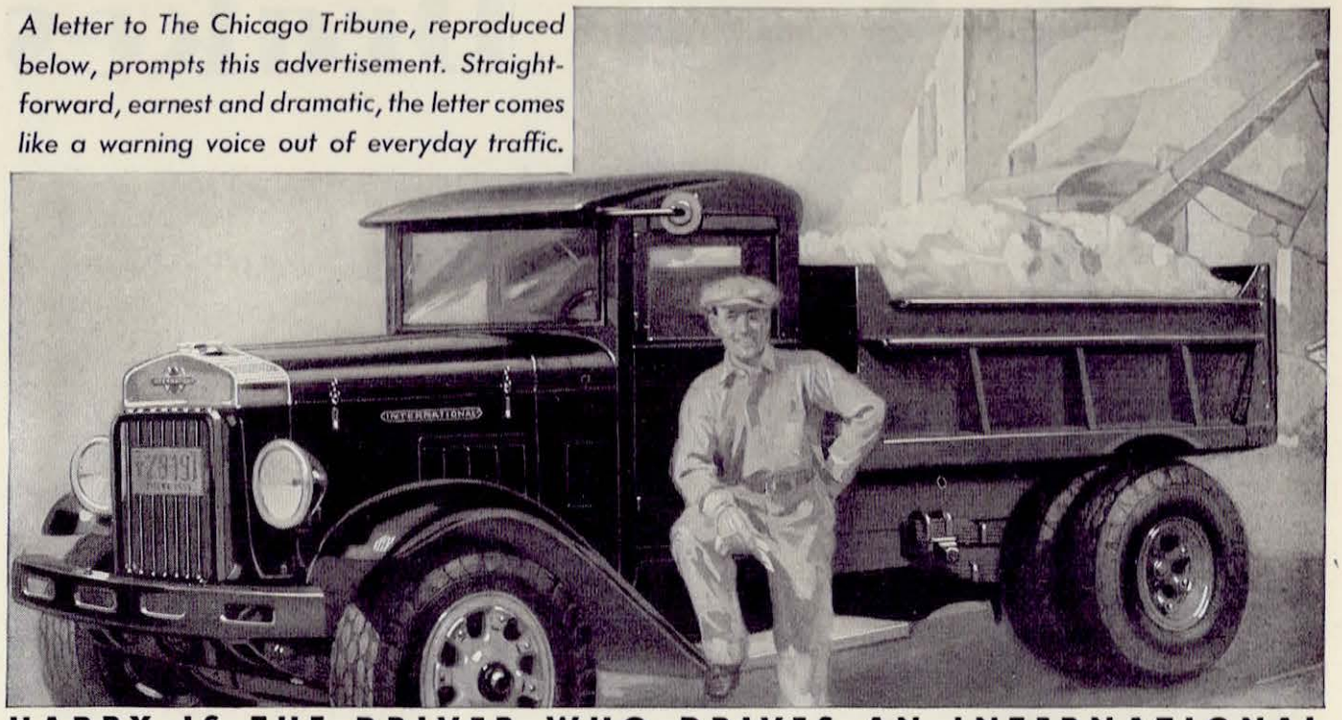
Finished BRAKE DRUMS *of* HUNT-SPILLER *Air Furnace* GUN IRON

A Veteran Driver Speaks His Mind

A letter to The Chicago Tribune, reproduced below, prompts this advertisement. Straightforward, earnest and dramatic, the letter comes like a warning voice out of everyday traffic.



HAPPY IS THE DRIVER WHO DRIVES AN INTERNATIONAL

THIS letter, which is reprinted from the "Voice of the Traffic" column of The Chicago Tribune, sounds a note to which every owner of motor trucks and truck fleets should give heed.

Do your trucks deserve to haul your loads? Or are there antiquated models among them, hazardous to life and limb, destructive to driver-morale, and raising costly hob with your profit opportunities? Turn the obsolete trucks out to pasture and *invest in efficient new equipment.*

✱There is a bright side to the veteran driver's letter. He admires the great modern fleet of Tribune trucks. This fleet, serving the Tribune organization, and used in the distribution of The Chicago Tribune, The New York Daily News, and Liberty, now numbers over 200 trucks, and *all of them are Internationals.*

The full line of Internationals—Speed Trucks and Heavy-Duty Trucks of new design—is ready for inspection at 182 Company-owned branches in the United States and Canada. Sizes from ¾-ton to 5-ton. Demonstration will be arranged at your request.

Above is one of the trucks this driver compliments so highly in his letter —it is one of The Chicago Tribune's large fleet of Internationals.

To the Chicago Tribune:

"I see that the Cook county police are beginning a drive against noisy trucks. Being a truck driver I believe that the authorities are taking the wrong course in warning drivers to make repairs.

The large cartage companies do not listen to the drivers' complaints, or else it is because our foremen do not inform the owners. Daily we are forced to take out patched up 10 and 15 and even 20-year old trucks, with faulty brakes, hard to shift, and still harder to steer.

As for loads, I have put a monster load of canned goods on one truck and hauled it through the city, praying all the time that no other vehicle would cut me off too close. Going at a speed of 10 miles an hour, I required 80 feet to stop, using both sets of brakes.

The speed governors on our trucks are all 'out of order,' and we are laid off if we do not make good time. It is the same if our chariots break down too often or if we have an accident, no matter how slight. It is only because we are expert drivers that we get by. I believe it really criminal to force men to drive some of the wrecks that are on the streets today.

✱ I notice (enviously, too) that the Tribune always has an up-to-date fleet of trucks, and I have yet to see one of them broken down on the street or in a serious accident."

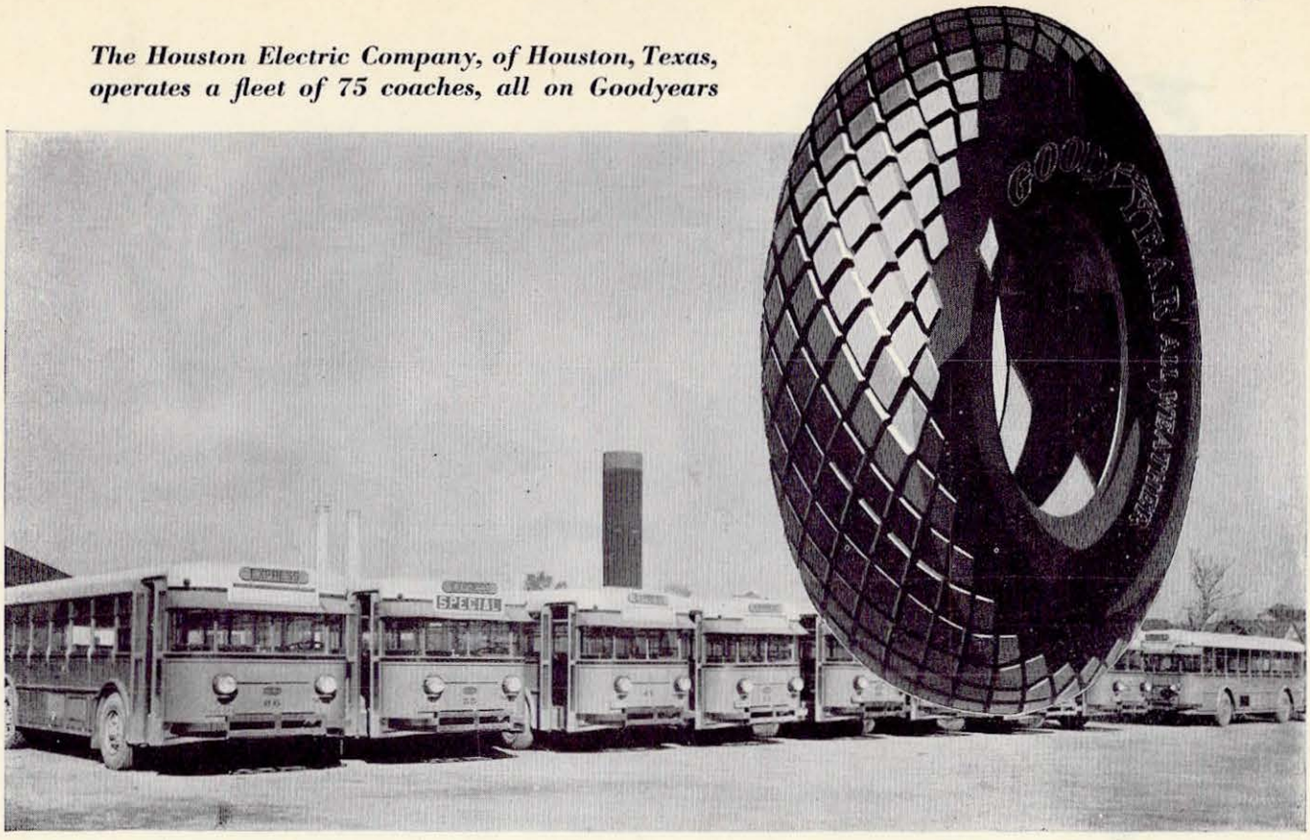
A Truck Driver

INTERNATIONAL HARVESTER COMPANY
606 So. Michigan Ave. OF AMERICA (INCORPORATED) Chicago, Illinois

INTERNATIONAL

INTERNATIONAL TRUCKS

The Houston Electric Company, of Houston, Texas, operates a fleet of 75 coaches, all on Goodyears



3,107,460 BUS MILES ON HOUSTON'S STREETS

Figures like these tell why Goodyear Tires are selected as standard equipment by so many motor coach operators. On the city lines of the Houston Electric Company last year, one tire traveled 65,000 miles. Another did 55,502 miles. Another, 55,227. Another, 45,476. Another, 45,000. Another, 35,866.

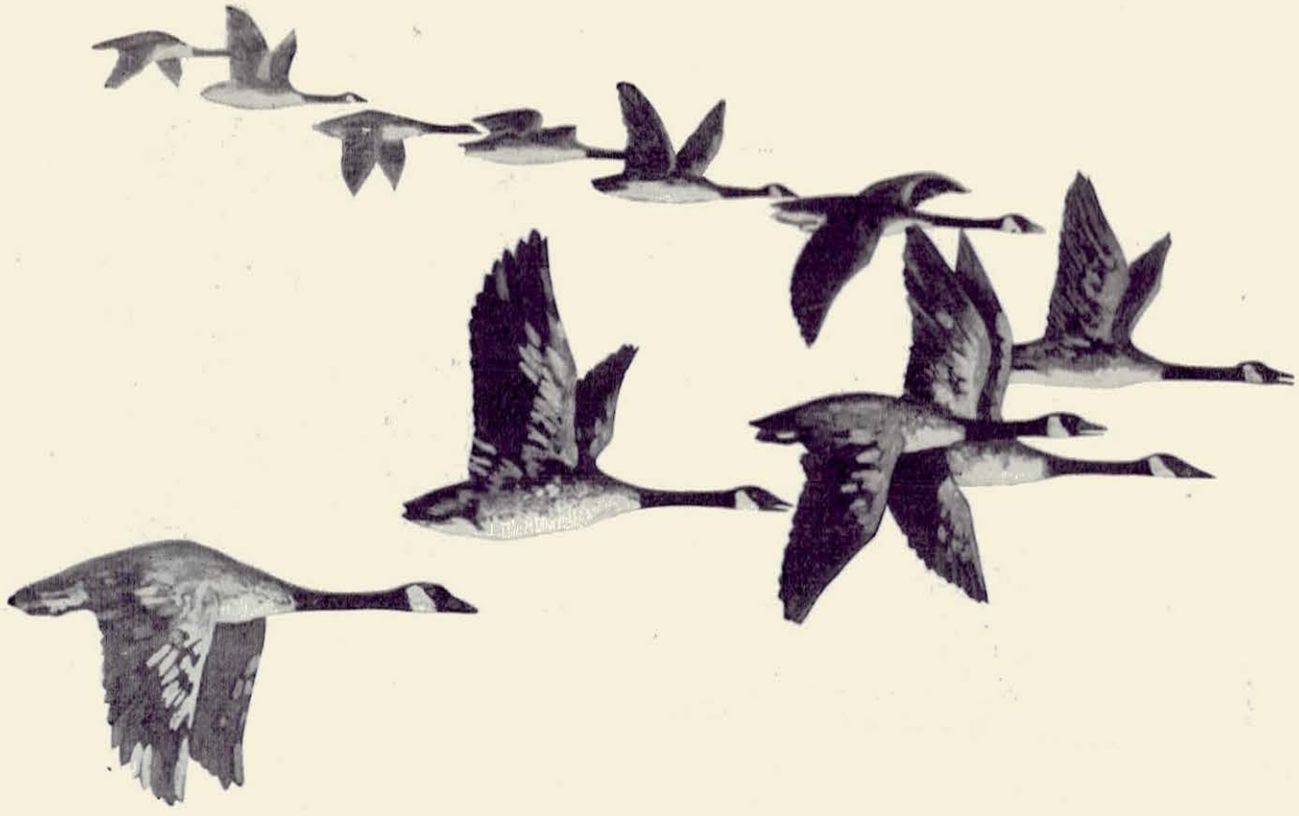
Back of such mileage figures is a bigger reason for using Goodyears — whether in city traffic or on fast, long-haul interstate routes, Goodyear Bus Balloons give you dependable service. In any weather, on any road, they give utmost help in maintaining schedules safely and comfortably, with a minimum of road delays.

No matter what your motor coach requirements, Goodyear Bus Balloons will meet them — with satisfaction and economy.

THE GREATEST NAME IN RUBBER

GOODYEAR

ON YOUR NEW COACHES SPECIFY GOODYEARS



Weatherproof Because Adjustable

The leaders among the flocks of the air, as well as among the "strings" on the road, are weatherproof because Nature, in one case, and Art, in the other, provided an adjustable covering.

The overlapping feathers of the wild goose and overlapping parts of the

Universal Dry Lading All-Steel Roof

serve in much the same way in weatherproofing the bird and the car lading under the movements of aerial or surface transportation.

© Hutchins Car Roofing Company

The Future of the Railways

On February 10 General W. W. Atterbury, president of the Pennsylvania railroad, delivered an address in New York in which he spoke somewhat optimistically regarding the future of the railways. On February 17, showing his faith by works, he announced plans for improvements to be made by the Pennsylvania during the next two and one-half years involving capital expenditures of $175,000,000. The purposes of expediting these expenditures, which originally were to have been spread over four years, are to take advantage of present low costs, to increase employment during the depression, and to prepare for the handling of increased traffic following the depression.

General Atterbury's address, which was quoted in our issue for February 14, gave the reasons for his comparative optimism and outlined the policies of co-ordination of different means of transportation which he believes should be permitted and encouraged by the state and national governments and adopted by the railways. If anything he said might tend to cause a doubt as to whether he believes our governments should treat all means of transportation alike, it should be removed by his reference to "establishing a basis for sound co-ordination of other forms of transportation with the railroads which will enable the public to utilize the kind of transportation it wants —railway, highway, waterway and airway—in the field in which each can best and most economically perform." There can be no determination of "the field in which each can best and most economically perform" as long as public policy permits, as General Atterbury said, "uneconomic and subsidized agencies to jeopardize the existence of those which are sound and self-sustaining."

Railroads Have Met Other Crises

General Atterbury has had thirty-five years experience as a railroad man, he is the head of the country's largest railroad system, and the optimism and courage he shows should be encouraging to all who desire the continued adequate development of our railroads, and the restoration of their earning capacity which is essential to such continued development.

No more serious mistake could be made, however, than that of assuming that the vitally needed improvement in the railway situation can be secured without a great struggle. There would be little reason for optimism if public sentiment were not unprecedently favorable to the railways, and if leaders in the railroad industry, in the railway labor unions, and in other industries closely affiliated with the railroads in interest, were not showing an unprecedented determination to fight with all their strength for fair treatment of the railways. The great problems presented are not those of individual railroads. There are some railroad systems so strong that they could weather a storm in which three-fourths of all the railroads would go down. The welfare of the public depends upon the welfare of the entire railroad industry, and therefore upon the solution of the problems of the industry.

It may be said that the railroad industry has been confronted with crises before, and has passed through them. It did not always pass safely through them, however. In the crises in the nineties a very large part of all our railways became bankrupt. In the crises of the great war government operation actually was adopted and threatened for some time to become permanent. In the 1921-22 period of depression, strikes and bitterly anti-railway sentiment in some territories, the future of the railroads as a private industry seemed far from certain.

The railways passed through these crises, and finally during the years 1923 to 1929 were able greatly to improve their properties and service, because, in each of these dangerous periods, strong organized efforts were made to pull them through. Their return to private operation under the Transportation act of 1920 was due to organized efforts that were stronger than the organized efforts made to perpetuate government operation, or at least to prevent constructive legislation needed to enable them to function under private ownership. The great improvement in their physical properties and service began with

the agreement of their chief executives upon the policies for the industry announced by them in the spring of 1923. The present favorable public sentiment is due to the concerted and individual efforts that have been made for years for the definite purpose of improving public sentiment.

Optimism Must Be Backed By Courage

Whether the railroad industry will pass safely through the present crisis, and enjoy greater prosperity in future than during the years immediately preceding the present depression, will depend (1) upon whether the managements of individual lines courageously raise and invest capital in ways that will effect economies and help to meet the competition of other means of transportation; (2) upon whether the railways will adequately control competition in rate-making and service among themselves; and, (3) upon the policies followed by the state and national governments in regulating railway rates and in dealing with competing means of transportation. Great economies in operation must continue to be made. Past experience has shown, however, that, as vitally essential as large economies are, they can be prevented by unfair regulation, excessive competition between railways and subsidized competition of other means of transportation, from enabling the railroad industry to earn adequate net return.

Optimism regarding the future is desirable if based upon confidence that the railroad industry intends to fight unitedly for its right to fair treatment and for the opportunity that it can be afforded only by such treatment to make adequate earnings and render the service that is essential to the welfare of the public. It should be frankly recognized, however, that the fight for such treatment has as yet barely begun, and that it can never safely be suspended.

The problems of an industry that is subject to government regulation are extremely different from those of an industry that is not subject to it. The railroads are our most regulated industry, and experience has conclusively demonstrated that nothing can be more dangerous than for the individual companies composing a regulated industry ever to forget that the solution of their individual problems depends upon the solution of the problems of the industry. If the time ever comes when a large part of our railways cannot be successfully managed under private ownership, the result will be government ownership for all of them.

Trends in Stores Control

In the stores department of a railroad that maintains master stock books with which to control its widely-scattered supply operations, a record has been kept of the cost of maintaining the books and the results of their operation. The master books are ledgers in which monthly records of the stocks of each storehouse are copied for use in checking incoming requisitions to see if the quantity ordered is justified or if its purchase can otherwise be avoided by transferring the material from other stores.

During the first year that this road followed the master plan, the transfers amounted to $202,361 and the value of orders reduced or cancelled amounted to $379,915, a reduction of purchases of $582,276. In the second year, the transfers were $506,396 and the reduction or cancellations $1,154,163, a total of $1,660,559. In the third year, the transfers were $182,167 and the reductions or cancellations $101,996, a total of $284,163, and, in the fourth year, the transfers were $50,468, the reductions or cancellations $6,288, a total of $56,756. The cost of maintaining the books at headquarters was approximately $6,000 each year.

The figures show that in every year the cost of keeping the books was considerably less than the value of the orders for material transferred or cancelled. They also show that the annual reductions effected in this manner shrunk materially with the continued use of the plan. The cost of the books could be considerably increased and yet satisfy the friends of master books as to their worth in stock control. On the other hand, the trend of the figures contain a suggestion that the need for such books may not necessarily be a perpetual one.

The most ardent advocate of master stock books recognizes that such a plan calls for uniformity in the stock books at all points of stock distribution. It appears, however, that a large number of roads, while friendly to standardization in principle, are not yet agreed that standardized stock books and the standardized arrangement of stock also required at stores points under this plan, are essential to effective and economical stock control. Standardized descriptions are unanimously advocated, but it is pointed out that the arrangement at one point may not be convenient where the kind and amount of stock, as well as the physical conditions of use, may differ. It is also advanced that well supervised methods of ordering, wherein the usual stock-book data are reported on each requisition, are sufficient for the central office to determine whether the material should be ordered in the quantities specified, without maintaining a secondary record in a master book. It is claimed that a system of reporting and returning surplus stocks currently is superior to making arbitrary transfers from one point to another from a central office. Advocates of this plan emphasize the inconvenience, delay and handling expense that often result where such transfers are made.

The most impressive evidence that the master stock book as originally introduced is not wholly free from objectionable features, however, lies in the many changes it has been undergoing on roads using it. Many revisions have been made in the form of reports re-

quired in order to render it more flexible and to afford an escape from the unwieldliness such books assume as the records from many stores accumulate during the year. Criticisms of the master stock books have been made by officers who have used them and some roads have recently abandoned the journal methods altogether for card systems. Other roads, aware of the large amount of work required at best under the plan to keep the stock books up to date, have been giving consideration to such modifications as will make the voluminous data on material consumption available for other purposes, most prominent among which is an arrangement of detail needed by the user of material to study supply trends and check waste.

The master stock-book system has been a great help to large railroads in reducing their inventories, but it is no longer widely believed to be the ultimate in stock-keeping and at a time like this when no method of doing railway work, however time-honored or popular, is exempt from those explorations and examinations calculated to determine worth, it is unquestionably a good thing to find it receiving so much consideration.

Railway Results in 1930

Such statistics of the Class I railways for the entire year 1930 as recently have become available tell a remarkable story of what occurred in the railroad industry last year. Total earnings were $5,342,957,447, or the smallest since 1919. They were $1,017,400,000 less than in 1929; $1,106,000,000 less than in the maximum year 1926, and even $230,000,000 less than in the depressed year 1921. Freight business was the smallest since 1922, and passenger business the smallest since 1906.

Operating expenses, which were $3,975,782,000, were the smallest since 1917, being $585,000,000 less than in 1929; $1,853,000,000 less than in the maximum year 1920, and even $38,000,000 less than in 1918, before most of the advances in wages due to the war had been made. Expenditures for maintenance of way and structures were the smallest since 1918, and for maintenance of equipment the smallest since 1917.

Net operating income was $885,000,000, or $390,000,000 less than in 1929, and the smallest since 1922. The percentage of return earned on investment was 3.36, as compared with 4.95 in 1929 and 3.59 in 1922, and was the smallest since 1921, when it was 2.87.

The figures show that the year was one of the hardest for the railways through which they have ever passed. They were saved from disaster by the extremely conservative policy of financing followed for many years, and by the gigantic reductions made in operating expenses, which were rendered possible only by previous liberal capital and maintenance expenditures.

Periods of prosperity always have been and probably always will be followed by years of depression. The effects produced by this depression should warn regulating authorities and the public that if the earnings of the railways are unduly restricted in years of prosperity, as they were from 1923 to 1929, they will always be confronted with great difficulties and dangers in every depression. The public cannot afford to disregard this, because the very large reductions of purchases and employment the railways have had to make to save themselves have been an important feature in deepening and prolonging the depression.

Adaptability of Centralized Control

The advantages of centralized traffic control for the operation of passing track switches and for signals used for directing train movements by signal indication without written train orders have been demonstrated on the numerous installations of such equipment that have been placed in service since the system was developed about four years ago. The benefits effected in expediting train movements and in reducing operating expenses are large in proportion to the first cost. However, certain roads have hesitated to install such systems, on the assumption that the cost would be prohibitive, without making a study of the territories involved to determine whether something short of a complete system would produce the desired results in facilitating train movements and reducing operating expenses.

In selecting the switches to be power-operated and the signaling to be used, excellent examples are afforded by several centralized control installations where power switches were provided at the junctions and at the sidings used most frequently, while at other sidings, which are seldom used under the new method of operation, the switches are hand-thrown, although signals are provided for directing train movements. Likewise, other main-line switches leading to industry and house tracks are hand-thrown, movements to and from the tracks being made on authority from the dispatcher, the same signaling protection being afforded as for any main-line switch in ordinary automatic block-signal territory.

Still further simplifications of centralized control are practicable under certain conditions. For example, on a division of a certain road handling important through passenger and freight traffic, a study revealed that the installation of a centralized system for the control of signals to direct train movements,

without the use of power switches for passing tracks, would permit a reduction in operating costs sufficient to justify the installation.

Thus it is evident that centralized traffic control systems may readily be adapted to meet the requirements of traffic. Especially where automatic signaling is now in service, the centralized control of signals to direct train movements can be superimposed at a minimum expense, and in most cases will show an attractive saving in operating expenses. Having provided the line circuit and control machine for the signals, power switches may be added at a minimum expense at any time when delays become excessive at certain junctions or passing sidings. Likewise, the territory controlled from the original machine may be extended at a cost far less in proportion than for a separate installation. Of course, these modified forms of centralized control installations all include the fundamental characteristics of improved safety afforded by directing train movements by signal indication as compared with the method of using written train orders. Studies may well be made at this time to determine where modern signaling will show the greatest benefits with minimum capital expenditures.

Two Opportunities

For the thirty-second consecutive year the American Railway Engineering Association will hold its annual convention in Chicago, the week after next—March 10-11. During the same week (March 9-12) the National Railway Appliances Association will present its twenty-third annual exhibit of materials and equipment entering into the construction and maintenance of roadway facilities. These events will take on more than normal interest this year by reason of the unusual period through which the railways are passing.

The A.R.E.A. has long been characterized by the seriousness with which it applies itself to the improvement of construction and maintenance practices. This year it has laid out for itself an even more strenuous program, bringing its normal three-day activities within the limits of two days without materially shortening the hours of work, by the expedient of longer sessions and the addition of an evening session on the first day. In this way it is planned to reduce to the minimum the time that the members need be absent from their duties without materially curtailing the time devoted to the presentation and discussion of the recommendations of the various committees.

With the same seriousness of purpose, the N.R.A.A. has prepared its exhibit this year. Prompted by the belief that any curtailment of its activities would be accepted in many quarters as lack of confidence in the future of business, and by the further fact that the materials and equipment that will be presented will be of more than normal interest this year to railway men who are confronted with the urgent necessity of cutting costs, the exhibitors are preparing to display more than the usual amount of new as well as standard equipment.

There has never been a time when there has been a greater demand for the most efficient methods and materials. The convention affords an opportunity to acquire information regarding the former; the exhibit provides a similar opportunity to learn of the latter. The times through which we are passing not only stimulate interest in such objectives but they demand it. These agencies present an opportunity to railway engineering officers of which they should take full advantage.

Store-Door Service Recovers Lost Traffic

In a period of general business decline, the Texas & Pacific Motor Transport Company, which is a subsidiary of the Texas & Pacific and offers store-door collection and delivery as a part of the transportation service it provides for l.c.l. freight, has enjoyed a steadily increasing traffic. In an article in this issue, T. E. Huffman, general freight agent of the motor transport company, shows how successful this organization has been in increasing its business and in meeting the competition of independent motor trucks. In only two of the first 12 months of the company's operation did the traffic handled fail to exceed that of the previous month.

A check of the shipments received showed that approximately 85 per cent of the tonnage of the transport company is freight recovered from competitive motor trucks. One shipper who formerly gave his traffic to competitive truck lines now routes 97 per cent of his business via the motor transport company.

The type of service offered by the Texas & Pacific Motor Transport Company—a through transportation service for l.c.l. freight, including pick-up and delivery by motor truck at points of origin and destination and movement between terminals by rail—was originated by the Pacific Electric and the Southern Pacific. The Texas & Pacific was the first road to offer this type of service on a system-wide basis. Other roads have since adopted it with success.

According to Mr. Huffman, a railway subsidiary of this kind can compete successfully with regulated highway truck lines on the basis of service and equal rates. He emphasizes the fact that the service offered must be equal to or better than the service of the truck line competitors, providing for late receipt of freight and delivery early the following morning to points as distant as 250 miles.

A New Era for the Railroads

The dollar paid for railroad transport goes farther than that expended upon any other form

Part II*

INCREASING use of oil, natural gas and water power in the past thirty years has given to many the impression that the use of coal will eventually be displaced to a large extent by these other agencies for production of heat and energy, and as a result the hauling of coal, which forms an important part of the freight carried by the railroads, will not play such a major part in the future.

Another factor is the increased efficiency in the use of coal.

The other side of the picture, however, is painted in the November 7, 1930, report of a Special Committee of the Chamber of Commerce of the United States of America, on National Water-Power Policies:

"In recent years, improvements in steam practice have reduced the production cost of steam-generated electric power to a much greater extent than progress in hydraulic practice has been able to reduce the cost of hydro-electric power, the result being that water powers in general are today materially less valuable than they were a few years ago.

"Improvements in steam practice reduced the average coal burned per kilowatt hour in public utility plants from 5.5 pounds in 1902 to 1.69 pounds in 1929. In large unit plants of the type now being constructed, further increase in steam pressure and other changes in course of active development indicate a probable general reduction in coal per kilowatt hour to about one pound. Some plants operate on less than a pound of coal per kilowatt hour at the present time. The continuing substitution of these large modern plants for smaller and less efficient ones is expected to result in a further material reduction in the average coal consumption per kilowatt hour for the country as a whole from the 1.69 pounds consumed in 1929."

George Otis Smith, newly appointed chairman of the Federal Power Commission, speaking before Congress on December 11, is quoted as saying:

"Efficiency in the production of power in steam plants has now reached the stage where only the most efficient water power plants can equal it."

Bituminous coal production in 1929 amounted to 532,000,000 tons, compared with 260,000,000 tons in 1902, the 1929 figure being only 8 per cent less than the war-time peak of 579,000,000 tons in 1918.

Mr. C. V. Beck, president of the St. Louis Coal Company, in a very comprehensive analysis appearing in the *Railway Age* of December 13, 1930, compares the amount of fuels used in 1929 to produce heat or steam in the United States, reduced to a comparable basis. He shows that 4.2 per cent consisted of natural gas, 12.1 per cent fuel oil and 83.7 per cent coal. Apparently coal is still the most important fuel.

Much misunderstanding has arisen regarding the relative merits of natural gas and coal as fuel because of the different units of measurement. Mr. Beck shows that one ton of average soft coal is equivalent to 27,777 cubic feet of natural gas; that coal at the mines is cheaper than gas at the wells; and that equivalent heat units can be transported 7 per cent more cheaply in the form of coal than in the form of natural gas. He also shows that the capitalization of the natural gas industry is at the rate of $100 per equivalent ton of coal, whereas investment in the coal industry is $4 per ton of annual production, and that the capitalization of that part of the railways' plant and equipment utilized by coal traffic is $8 per ton.

Regarding fuel oil, an article in the November 6th issue of "Oil and Gas Journal" entitled "Decline in Fuel Oil Supply as Gasoline Recovery Increases," contains the following:

"The conservation program for crude oil is based on three main propositions, namely, that the supply of crude oil should be considered as limited from the viewpoint of future needs, that motor fuel and lubricants are the most essential oil products since fuel oils can be more readily replaced by coal.

"A decline of 50 per cent in the fuel oil supply in the United States based on the situation in 1928 would mean a decrease from 400,000,000 barrels to about 200,000,000 barrels. The decrease in domestic consumption to be replaced by other sources of energy would be about 160,000,000 barrels, equivalent to about 45,000,000 short tons of coal."

In this connection it is reported that for several years fuel oil has been making no further inroads into coal tonnage, and in some places users of oil have been returning to coal.

Regarding water power, the investment in plant is so much greater in hydro-electric generating plants than in modern steam generating stations of equal capacity, that the saving in interest on the difference will go a long way in paying for coal to run the steam plants. Moreover, steam plants can be located closer to large manufacturing centers, and are thus less subject to loses in transmission to which hydro-electric plants are subject. It has been estimated that for power generated at the Boulder Canyon project on the Colorado River the loss in transmission to Los Angeles, about 230 miles, is 15 per cent to 20 per cent.

It is this loss in transmission, as well as the fact that sufficient bodies of water for condensers are seldom found contiguous to the great coal fields, that makes it a difficult engineering feat to locate great power plants in the mountains and transmit the power by wire instead of by rail.

Years ago, the value of coal was confined to fuel, coke and gas. Since the war the value of coal-tar derivatives have been of increasing proportions. Modern science has developed greater and greater efficiency in the use of coal, but the article itself is more valuable in commerce than ever before.

The coal industry itself anticipates that coal tonnage figures will in a few years again be on the ascendency.

The above study of the construction costs of pipe lines, waterways, highways and air lines leads quite forcibly to the conclusion that the plant investment of the railroads thus compared is most conservative, and to make this still more clear, the book value of all railroad property used in the public service and the capitalization of same, including freight terminals, passenger stations and equipment, reduced to dollars a mile of transportation system, are given in a table below. There are also presented in the same table the corresponding figures for seven typical trunk line systems.

In studying costs, it is also illuminating that the Washington Terminal, which represents the entrance into Washington of the Pennsylvania, Baltimore & Ohio, Southern Railway, Chesapeake & Ohio, Atlantic Coast

* This is the second installment of an analysis of the railroad situation prepared by Horatio L. Whitridge of the stock exchange firm of J. S. Wilson, Jr. & Co., of Baltimore and published in pamphlet form by that company. Part I, which was published, by permission, in last week's *Railway Age*, discussed, among other things, the trend of railroad efficiency and earnings, the effect of the Interstate Commerce Commission's rate policy, and the limiting factors as railway competitors of waterways, pipe lines and air and motor transport. Copies of the complete analysis, from which this presentation is somewhat abridged, are available on request from J. S. Wilson Jr. & Co.—EDITOR.

Line and Seaboard Air Line, stands on the books of the operating company, including road and equipment, at $16,580,000, as compared with an investment of over $5,000,000 for the Roosevelt Flying Field and $4,000,000 voted by the citizens of Baltimore for a municipal airport.

These short chapters on the competitive forms of transportation bring out also the fact that the railroads are the most complete and self-contained form of transportation, and considering the various services rendered, the railroad dollar goes further than any other transportation dollar.

Table of Comparative Investment and Capitalization

DECEMBER 31, 1929

	Mileage	Investment Per Mile	Capitalization Per Mile
All Railroads	249,433	$102,091	$89,430
New York Central	6,915	232,304	163,771
Baltimore and Ohio	5,577	186,119	156,951
Pennsylvania	10,579	177,559	108,047
Union Pacific	9,869	112,660	72,512
Illinois Central	6,721	105,769	79,497
Atchison	12,711	92,677	53,290
Rock Island	8,110	60,314	50,335

The pipe line, motor, waterway and aeroplane all contribute to the development of the country's resources, are in line with progress and make it a more pleasant place to live in; but it is to their own interest that the American people should not lose their sense of proportion or relative values and encourage the extravagant expenditure of capital without hope of return, or foster one industry through subsidies and waiving of taxes at the expense of another.

The railroads themselves can do more than any other instrumentality to solve their present transportation problems by forgetting their own petty quarrels and jealousies and with a united front present their case to the American public, and the most comprehensive roster of the American public is the list of registered automobile owners, of which there are some 23,000,000.

The Ford owner, the Chevrolet owner, the Buick owner and the Packard owner is the bread-winner—he is the taxpayer and the voter. His taxes, as well as those of the railroads, are being expended upon inland waterways which he seldom uses; his taxes, in part, are building the highways; it is to his interest that these highways be smooth and pleasant to ride upon, and safe for himself and family. At the same time he counts on the railroad service for the long journey, or in case of rain, or snow or sleet.

If the pipe line is an economic contribution to the oil industry, he is for it. If it is used to control the price of gasoline at the source, he is against it.

The conviction is growing upon him that if there is to be any benefit from railroad mergers the ideas of the men who have devoted their life to railroading and are responsible for the operation of these systems should have more weight than the ideas of the theorist.

He knows it would be in the public interest if railroad executives were permitted to devote more time to railroading and less to hearings before the Commission.

The automobile owner is the holder, directly or through his insurance company and savings bank, of railroad securities, and is interested in the regular payment of interest and dividends upon the same.

The automobile owner knows that the automobile has given the railroads more in freight than it has taken away in passenger service, and he knows that the years of prosperity in the automobile industry have also meant prosperity to the railroads.

Thus, the automobile owner is naturally the friend of the railroads, and his co-operation should be sought.

Origin and Purposes of the Valuation Bill of 1913

On November 12, 1930, U. S. Senator Ellison D. Smith of South Carolina, addressing the convention of National Association of Railroad and Utilities Commissioners, is quoted as saying:

"For years and years the first streak of dawn in the industrial development of the present age was the steam railroads and the steamboat. Had the legislators at that time known the potentiality that was throbbing in the heart of that little crude thing, the first thing to apply time to locomotion, the history of this country might have been different."

"But that was the first dawn, it was a monopoly. What did it do? It solved the problem of tremendous tonnage and long-distance transportation; it did more than that, it built an empire; it solved the problems of distance and opened up and made possible the accommodation and the communication between the sections of the country and built them up.

"Oh, we lavished upon them the richest kind of legislation. You remember the history of the Union Pacific; we gave them half the West, they didn't know what to do with the land, we just piled it up. I think Texas gave them some two or three sections to get some railroads. And, naturally, having the monopoly, the history of the railroad business in this country, up to the inauguration of the I. C. C., was not such a lover of mankind, not very much so; and it hasn't been such a shining example of philanthropy and charity ever since then."

Here is a member of Congress who in 1930 was still laboring under the delusion that the railroads got something for nothing, were a dangerous monopoly, and in his mind there seems to echo President Roosevelt's all-embracing opprobrium, "malefactors of great wealth."

In speaking of the land grants granted by the Government as an aid to railroad building in the West, and the grants to the Union Pacific in particular, Senator Smith was doubtless thinking of the rich Mississippi Valley as it is today, with its great metropolitan cities, New Orleans, St. Louis and Kansas City. But Senator Smith forgot much of the land that was given to the railroads cost the Government nothing at all, having been taken from the Indians, and that in 1803 the United States acquired from France through the Louisiana Purchase a territory approximately 1,000,000 square miles in area, embracing practically the entire Mississippi Valley. From this great domain were carved the states of Louisiana, Missouri, Arkansas, Iowa, Minnesota, North Dakota, South Dakota, Nebraska and Oklahoma in their entirety, and much the greater part of Kansas, Colorado, Wyoming and Montana. For this imperial domain the United States paid $11,250,000 outright, the final payments for interest and claims for French citizens raising the total cost to $27,267,622, or about 4 cents an acre.

And again as late as 1854, when the era of railroad building was on its way, the United States acquired from Mexico through the Gadsden purchase 45,535 square miles of land in what is now New Mexico and Arizona. The price was $10,000,000, or at the rate of approximately 34 cents an acre. Thus, through these purchases, it acquired 669,142,000 acres at a total cost of $37,267,622, or an average cost of approximately 6 cents an acre. Most of the land grants were made to the railroads between the years 1850 to 1870 and aggregated 155,504,000 acres, which at original cost represented a donation on the part of the government of $8,570,000.

The railroads were not philanthropists, but neither was the government, for it shrewdly figured that in developing their own land the railroads would at the same time make the land that the government retained more valuable, and the government also stipulated that "land grant roads" must carry government supplies and troops at a rate reduction approximating 50 per cent and mail 20 per cent less than the regular rates. In 1928 the saving to the government in both freight and passenger rates resulting from land-grant contracts was approximately $4,350,000.

(The third and concluding installment of Mr. Whitridge's thorough analysis of the present railroad situation will be published in next week's *Railway Age*.—EDITOR.)

Burlington Gas-Electrics Cut Operating Costs

Fifty-seven cars make 3,341,004 miles in 1930, demonstrating 94.0 per cent availability and 36.3 per cent saving over steam train service

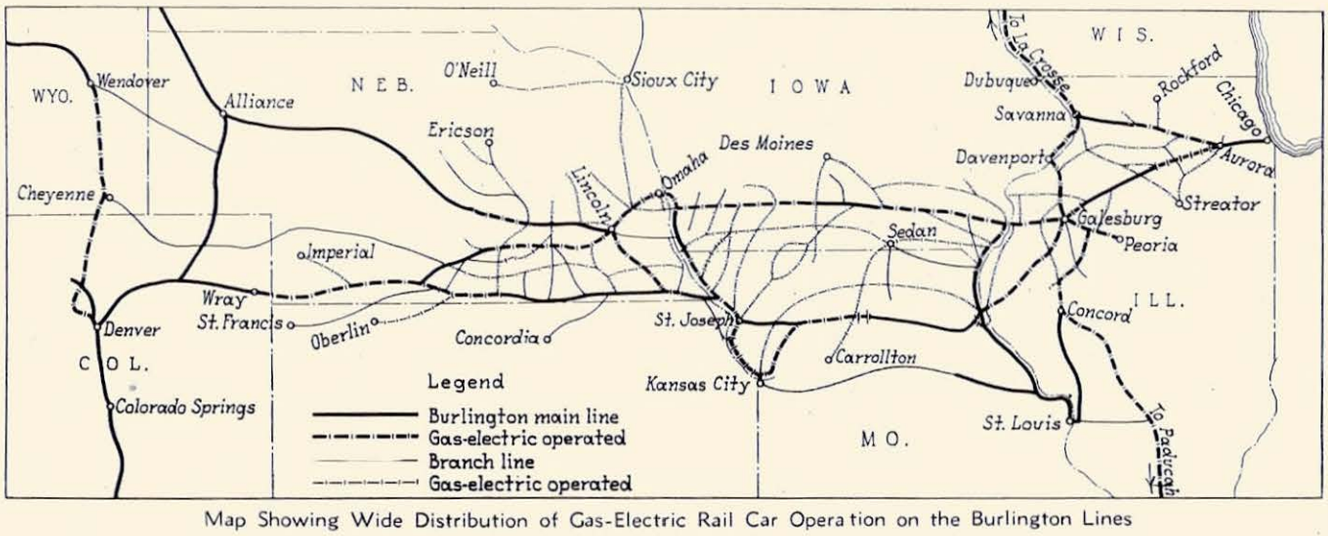
THE Chicago, Burlington & Quincy is at present using more gasoline rail motor equipment than any other one road. In addition to seven gas-mechanical cars, it operates a total of 60 gas-electric cars in passenger-train service, including two on the Colorado & Southern and one on the Wichita Valley. The 57 gas-electrics on the Burlington proper made 3,341,004 miles in 1930, demonstrating a high degree of availability and economy. Making allowance for out-of-service time due to traffic and causes other than disability, the availability of these cars was 94 per cent. Almost 60 per cent of the motor-train mileage was made with trailer equipment, either one or two cars. The cost of gasoline, fuel and lubricating oils per mile was 6.11 cents; repairs, labor and material, 5.03 cents; and total operating expense, 27.04 cents. Allowing 6 per cent interest on the investment and a generous depreciation rate of 8 per cent, these gas-electrics, as shown in the table earned 28.5 per cent on the investment in 1930, and saved $699,290, or 36.3 per cent of the cost of equivalent steam train service.

In addition to the savings mentioned, the extensive use of rail motor equipment and the consequent retirement of a large number of steam locomotives, mostly of the 4-4-0 and 4-6-0 types, has resulted in certain indirect economies such as lessened use and, therefore, reduced maintenance of coal, water and cinder-handling facilities; also, wyes and turntables owing to double-end control on a limited number of cars. These savings are no less real because difficult to allocate and estimate, and no attempt has been made to set a definite value on them. The Burlington locomotives, which were retired, averaged about 40 years old, the larger ones weighing 223,000 lb., and all being unequipped with superheaters, feedwater heaters, or similar modern appliances. While many of these locomotives were scrapped or sold, no scrap or sales value was credited to the gas-electric equipment account. Taxes were charged against general operation and do not appear as direct charges against either locomotives or rail cars.

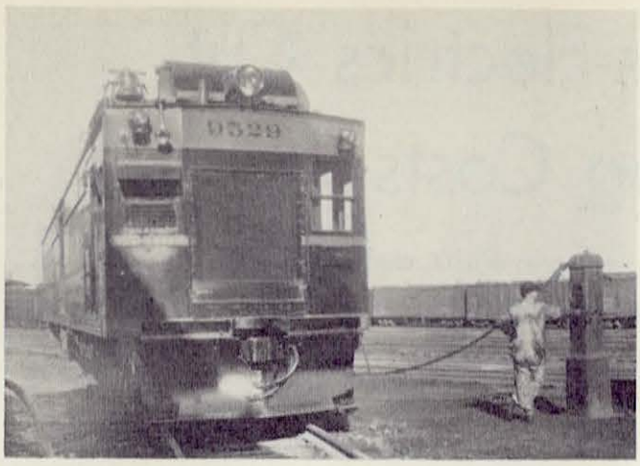
To facilitate comparisons with gas-electric operation on other roads having variable investment costs and car capacity, as well as different charges for labor, fuel and supplies, it may be stated that, on the Burlington, the cost of gasoline, per gallon on the car, is taken as .0893 cents; lubricating oil, per gallon on the car, .415 cents; estimated kw.-hr. per gal. of gasoline, 4.25; average hp. per car, 300; investment per hp., $138; age of cars, one to three years; weight of gas-electric car (400 hp.), 138,000 lb., (275 hp.), 116,000 lb.; weights of trailers, 70,000 lb. to 90,000 lb. These trailers have been rebuilt largely from old coaches, of which there was a surplus after changing to gas-electric operation. Others have been rebuilt for other service or scrapped, but without crediting the gas-electric account for these replacements.

Possibilities of Rail Motor Cars Early Appreciated

The Burlington was one of the first roads to appreciate the possibilities of economy and reduced operating expense due to the replacement of steam service by motorized equipment, which saved fuel and water costs, crew expense, locomotive maintenance cost, engine handling at terminals, fuel standby loss, cinder-handling expense, and, at the same time, permitted giving better service to the territories served by the Burlington. The first passenger motor car used on the Burlington weighed 21,000 lb. and was driven by a four-cylinder gasoline engine, developing 53 hp. and provided with mechanical



Map Showing Wide Distribution of Gas-Electric Rail Car Operation on the Burlington Lines

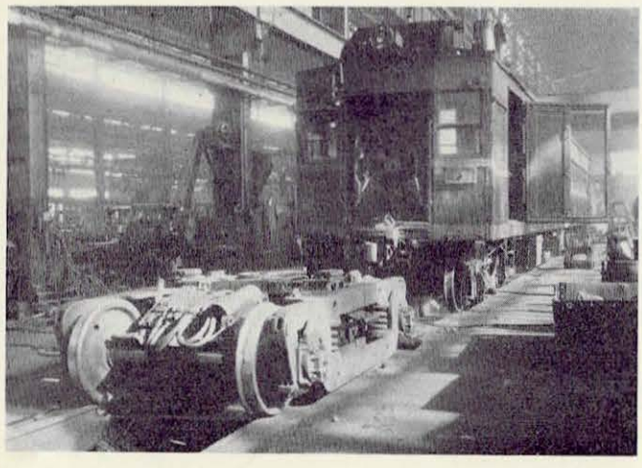


Gas-Electric Rail Car Being Refueled at the West Burlington Terminal

transmission to the car wheels. This car was placed in service in January, 1923, between Atchison, Kan., and Armour, Mo., on a shuttle run, replacing a steam train and saving $206 a month. In the next three years, six additional mechanical-drive cars were placed in service. While the performance of these cars was generally satisfactory and they effected a substantial saving over steam train operation, they were of small capacity. The need for greater power and more load-carrying capacity than was possible with a mechanical-transmission car was met by the development of gas-electric equipment which, at this time, had passed the experimental stage and had become a potential money-saver for the railroads.

The first gas-electric car on the Burlington was placed in service in January, 1927, and, since that time, 60 cars have been purchased, as mentioned. They are all used in passenger train service, handling passengers, baggage, express and mail, on both branch and main lines, the wide distribution of which is shown in the map. Gas-electric equipment is used to a greater or less extent on practically the entire lines east except between Chicago, Ill., and Aurora; La Crosse, Wis. and St. Paul, Minn.; Kansas City, Mo., and St. Louis. With the exception of two runs by cars on the Colorado & Southern, Wray, Colo., and Ravenna, Neb., mark practically the limit of the present extension of gas-electric operation on the Burlington towards the west. Twenty-one cars are used in main line service. Reference to the table of equipment assignment shows 44 cars equipped for handling railway mail; also, that nearly half of the cars carry express and baggage, but no passengers. None of the motor cars carry passengers exclusively.

The power capacities of gas-electric cars on the Burlington are also indicated in the table, which shows that there are 14 cars equipped with Electro-Motive, eight-cylinder, 400-hp. power plants; 43 Electro-Motive, six-cylinder, 275-hp. power plants; one Brill-Westinghouse, six-cylinder, 250-hp. power plant; one Electro-Motive, six-cylinder, 225-hp. power plant; and one Mack, 240-hp., dual-power plant. Nine of the cars are provided with Westinghouse electrical equipment and 51 with General Electric equipment. Seven cars have double-end control, for operation in either direction without turning.



Gas-Electric Car Undergoing Heavy Repairs at West Burlington Shops—The Engine and Generator Are Removed

General Method of Operation

In general, gas-electric cars are assigned to lines where they will effect substantial economies and at the same time give adequate service. About two-thirds of the gas-electric rail cars have regular enginemen and one-third are in pooled service. Gasoline fuel is secured from 14,000-gal. underground storage tanks, equipped with metering pumps and unloading rigs, located at all terminal and division points where rail motor cars are maintained and serviced. Lubricating oils, Crater compound, greases, sand, waste, etc., are taken on at the same time and a record kept of the respective amounts.

Performance of 57 Gas-Electrics on the Burlington in 1930

Total assigned days	17,720
Total days in service	16,440
Per cent of assigned days covered	92.8
Total days motor cars held for repairs	1040
Total days out account of traffic and causes other than disability	234
Availability	94 per cent
Total motor-train mileage	3,341,004
Total trailer mileage	1,934,012
Percentage of trailer miles to motor train miles	57.8
Average motor-train miles per gal. of gas	1.49
Average motor-train miles per gal. of lubricating oil	41
Gal. of lubricating oil per 100 train-miles	2.44
Cost of repairs, labor and material, per mile	$.0503
Cost of fuel and lubricating oils per mile	$.0611
Total operating expense per mile	$.2704
Total cost of gas-electric motor-car investment	$2,413,273.45
Depreciation per mile, at 8 per cent ($178,594.84 per year)	$.0534
Interest on investment per mile, at 6 per cent ($133,946.38 per year)	$.0400
Total fixed charges per mile, ($336,858.29 per year)	$.0934
Total operating cost of steam train service per mile, based on previous surveys ($1,904,372.28 per year)	$.5706
Total operating cost per mile of gas-electric service, including 6 per cent int. and 8 per cent depreciation ($1,216,082.08 per year)	$.3638
Total saving per mile over steam train ($688,290.20 per year)	$.2068
Return on investment, per cent	28.5

An idea of the kind of inspection and conditioning work done on gas-electric cars may be gained by a study of what happens to cars No. 9627 and No. 9628, which operate as alternates on a typical run between Keokuk, Iowa, and Shenandoah, a distance of 244 miles, making 47 stops each way in a total lapsed time of 10 hr. 18 min., or running time of 8 hr. 12 min., or at 28.8 m.p.h. average speed. The cars lay over on alternate nights at Shenandoah, being maintained at Keokuk every other night by one mechanic in an average time of four hours a night per car. On arrival of the car at the terminal, it is inspected by the mechanic, the gas tank filled and the oil checked. Certain details such as lubrication, checking, electrical-equipment relay contactors, examining bearings, batteries, wheels, brake equipment, flange lubricators, etc., require attention daily. The car heating plant in winter also is given attention and a new fire made after each trip. The car is cleaned, inside and out, by a coach cleaner. Other details like valve-tappet adjustment, cleaning magnetos, spark plugs, etc., receive attention once a week. Other important inspection and

conditioning work is done twice a month, once a month, or sometimes on a mileage basis. In order to make sure that none of this work is overlooked, a compact card, Form 1659, carried in the cab, shows just what the detailed requirements are and provides spaces for the signature of the maintainer and the date each operation is performed. A new card, furnished each month, affords a record of maintenance work on each car. The only additional maintenance records kept on the Burlington are a weekly statement, Form 1661, signed by the master mechanic, and showing material needed and cars held out of service for repairs; also a condition report, Form 1660, filled out by the district motor-car supervisor, following an inspection of each car once a month.

Light repairs given to the rail motor cars at all terminal and layover points include changing cylinder heads, grinding valves, applying new ignition cables, adjusting bearings, cleaning electrical equipment, installing new rings in air compressor, testing air-brake equipment, changing brake shoes, etc., and renewing any parts necessary. Special attention is also given to the condition of trucks and wheels and flange oiling equipment. Wheel wear is dependent upon a number of circumstances, including the severity of the service and track conditions. In general, wheels make about 35,000 to 45,000 miles before wheel-truing brake shoes are used to cut down the high flanges, afterwards being trued about every 6,000 miles until the next general shopping. In case of accident or necessary wheel removal for turning, a reserve power truck held at the general shop is applied, thus permitting the car to continue in service. The cars are refinished by painting on the average of about every two years. The front ends of the cars are painted

Assignment of Passenger Motor Cars on C. B. & Q., Lines East and West

Car no.	Present assignment		Car length	Railway post office	Baggage-express	Passeners: Smoker	Passeners: General	Built by	In service
9500	Emergency-Atchison, Kan.		32 ft. 7 in.	None	7 ft. 10 in.	None	42	Edwards	1- 2-23
9502	Emergency-Hannibal, Mo.		43 ft. 0 in.	None	17 ft. 2 in.	None	41	Edwards	12- 3-24
9503	Litchfield-Concord, Ill.		43 ft. 0 in.	None	17 ft. 2 in.	None	40	Edwards	2-27-25
9505	Armour-Atchison, Kan.		43 ft. 2 in.	None	19 ft. 7 in.	10	27	Edwards	3-15-26
9506	Hannibal-Quincy, Ill.		43 ft. 2 in.	None	24 ft. 5 in.	10	17	Edwards	3-26-26
9507	Shop train—W. Burlington, Iowa		43 ft. 2 in.	None	26 ft. 10 in.	None	22	Edwards	6- 3-26
9508	Unassigned, Havelock, Neb.		43 ft. 2 in.	None	26 ft. 10 in.	10	12	Edwards	5- 3-26
	Gas-Electric Cars								
9509	Rochelle-Rockford, Ill.	X-C	60 ft. 0 in.	None	14 ft. 6 in.	None	42	Brill	1-11-27
M 9450	Beardstown-Davenport, Iowa	B-W	65 ft. 0 in.	None	None	25	52	Pullman	8-10-28
M 9525	Red Cloud-Wray-McCook, Neb.	B-G	65 ft. 0 in.	None	24 ft. 10 in.	15	24	Pullman	8- 1-28
9528	McCook-Imperial-Red Cloud, Neb.	B-G	65 ft. 0 in.	None	24 ft. 10 in.	15	24	Pullman	8- 9-28
M 9527	Savanna-N. LaCrosse, Wis.	B-G	65 ft. 0 in.	None	30 ft. 8 in.	None	32	Pullman	8-23-28
9529	Burlington-Washington, Iowa	B-G	65 ft. 0 in.	None	30 ft. 8 in.	10	19	Pullman	12-13-28
9525	Earlville-Barstow, Ill.	X-B-G	65 ft. 0 in.	None	36 ft. 6 in.	None	22	Pullman	8-20-28
M 9530*	Lincoln-Table Rock, Neb.	D-G	65 ft. 7 in.	None	27 ft. 8 in.	12	27	H.K.P. Co.	6- 9-26
9625	Burlington-Carrollton, Mo.	B-W	65 ft. 0 in.	15 ft. 0 in.	None	16	37	Pullman	8-15-28
9626	Burlington-Carrollton, Mo.	B-W	65 ft. 0 in.	15 ft. 0 in.	None	16	37	Pullman	8-16-28
9627	Keokuk-Shenandoah, Iowa	B-W	65 ft. 0 in.	15 ft. 0 in.	None	16	37	Pullman	10-26-28
9628	Keokuk-Shenandah, Iowa	B-W	65 ft. 0 in.	15 ft. 0 in.	None	16	37	Pullman	8-15-28
9629	Lincoln-Columbus, Neb.	B-G	65 ft. 0 in.	15 ft. 0 in.	None	16	37	Pullman	8-16-28
9813	Ft. Madison-Ottumwa, Iowa	B-G	65 ft. 0 in.	15 ft. 0 in.	21 ft. 4 in.	None	22	Pullman	12-22-28
9812	Villisca-Bigelow-Napier, Mo.	B-G	65 ft. 0 in.	15 ft. 0 in.	24 ft. 3 in.	17	None	St. L. C.	10- 1-27
9811	Hastings-Stromsburg, Neb.	B-G	65 ft. 8 in.	15 ft. 0 in.	27 ft. 2 in.	12	None	St. L. C.	9-30-27
9734	Charitou-St. Joseph, Mo.	A-G	65 ft. 0 in.	15 ft. 0 in.	33 ft. 3 in.	None	None	Pullman	2-27-29
9735	Villisca-St. Joseph, Mo.	X-A-G	65 ft. 0 in.	15 ft. 0 in.	33 ft. 3 in.	None	None	Pullman	3-14-29
9725	Aurora-Streator, Ill.	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	St. L. C.	5- 3-27
9726	Buda-Rushville, Ill.	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	St. L. C.	5- 3-27
9727	Creston-St. Joseph, Mo.	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	St. L. C.	9-23-27
9728	Galesburg-Burlington	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	St. L. C.	9-22-27
M 9729	Ravenna-Aurora, Ill.	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	Pullman	8-24-28
9730	St. Joseph-Creston, Iowa	B-W	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	Pullman	8-24-28
9731	Emergency, Lines east	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	Pullman	9-11-28
9732	DesMoines-Cainsville, Mo.	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	Pullman	12-26-28
9733	DesMoines-Creston, Iowa	B-G	65 ft. 0 in.	15 ft. 0 in.	39 ft. 1 in.	None	None	Pullman	12-26-28
M 9569	Brookfield-Kansas City, Mo.	X-E-G	75 ft. 0 in.	None	25 ft. 0 in.	18	37	Pullman	10-25-28
M 9566	Creston-Omaha, Neb.	B-G	75 ft. 0 in.	None	26 ft. 1 in.	15	42	St. L. C.	10-24-27
M 9567	St. Joseph-Kansas City, Mo.	B-G	75 ft. 0 in.	None	26 ft. 1 in.	15	42	St. L. C.	10-21-27
M 9568	Lincoln-Kearney, Neb.	B-G	75 ft. 0 in.	None	29 ft. 0 in.	10	39	St. L. C.	10-14-27
M 9570	Aurora-Rochelle-Oregon, Ill.	X-A-G	75 ft. 0 in.	None	29 ft. 0 in.	10	29	Pullman	11-15-28
9571	Cody-Frannie, Wyo.	B-G	75 ft. 0 in.	None	40 ft. 8 in.	10	19	Pullman	12-19-28
9665	Quincy-Kansas City, Mo.	A-G	75 ft. 0 in.	15 ft. 0 in.	None	16	44	Pullman	10-27-28
9666	Quincy-Kansas City, Mo.	A-G	75 ft. 0 in.	15 ft. 0 in.	None	16	44	Pullman	11-15-28
M 9835	Omaha-Schuyler, Neb.	B-G	75 ft. 0 in.	15 ft. 0 in.	22 ft. 7 in.	10	27	St. L. C.	5- 7-27
9836	Centerville-Carrollton, Mo.	B-G	75 ft. 0 in.	15 ft. 0 in.	22 ft. 7 in.	10	27	St. L. C.	5- 6-27
M 9843	Beardstown-Metropolis, Ill.	X-B-G	75 ft. 0 in.	15 ft. 0 in.	22 ft. 7 in.	10	27	Pullman	7-27-28
M 9845	Beardstown-Metropolis, Ill.	B-W	75 ft. 0 in.	15 ft. 0 in.	22 ft. 7 in.	10	27	Pullman	7-27-28
9837	Burlington-Oskaloosa, Iowa	B-G	75 ft. 0 in.	15 ft. 0 in.	25 ft. 6 in.	10	22	St. L. C.	10-28-27
M 9841	Burlington-Quincy, Ill.	B-G	75 ft. 0 in.	15 ft. 0 in.	25 ft. 6 in.	None	32	Pullman	8-14-28
9838	Streator-Denrock, Ill.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	St. L. C.	10-27-27
9839	Republican-Oberlin, Kan.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	St. L. C.	10-26-27
9840	Palmer-Burwell, Neb.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	St. L. C.	11- 3-27
9842	Aurora-Clinton, Ill.	X-B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	Pullman	8- 1-28
9844	Emergency, Lines east	B-W	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	None	27	Pullman	7-26-28
9846	Creston-Cumberland, Iowa	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	Pullman	8- 2-28
9847	Nebraska City-Holdrege, Neb.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	Pullman	8- 2-28
9848	Nebraska City-Holdrege, Neb.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	Pullman	8- 3-28
M 9849	Burlington-Quincy, Ill.	B-G	75 ft. 0 in.	15 ft. 0 in.	28 ft. 5 in.	10	14	Pullman	12-13-28
9565	Red Cloud-Aurora, Neb.	B-G	75 ft. 0 in.	None	26 ft. 1 in.	13	42	St. L. C.	5-16-27
M 9765	Peoria-DesMoines, Iowa	A-G	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	2-27-29
M 9766	Peoria-DesMoines, Iowa	A-G	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	2-27-29
M 9767	Lincoln-Sioux City-O'Neill, Neb.	A-G	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	11- 3-30
M 9768	Lincoln-Sioux City-O'Neill, Neb.	A-G	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	11- 4-30
M 9769	Peoria-Quincy, Ill.	A-G	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	10-29-30
M 9770	Wymore-Omaha, Neb.	A-W	75 ft. 0 in.	15 ft. 0 in.	43 ft. 3 in.	None	None	Pullman	10-28-30
C. & S. 401	Cheyenne-Wendover, Wyo.	A-G	75 ft. 0 in.	15 ft. 0 in.	22 ft. 7 in.	27	None	Pullman	28
C. & S. 402	Fort Collins-Denver, Colo.	A-G	75 ft. 0 in.	None	59 ft. 2 in.	None	None	Pullman	29
W. V. 20	Stamford-Wichita Falls, Tex.	A-G	75 ft. 0 in.	15 ft. 0 in.	44 ft. 0 in.	None	None	Pullman	30

A—8 cylinder, Model 148 Electro-Motive power plant—400 hp.
B—6 cylinder, Model 120 Electro-Motive power plant—275 hp.
C—6 cylinder, Brill-Westinghouse power plant—250 hp.
D—6 cylinder, Model 106 Electro-Motive power plant—225 hp.
E—Mack Dual power plant, Model AQ—120 hp. each.
W—Westinghouse electrical equipment.
G—General Electric electrical equipment.
X—Double-end control.
M—Main line operation.
*—Converted into gas-electric at Havelock shops and placed in service November 18, 1929

red and yellow to attract attention at road crossings; also, so that they can be seen at a greater distance by trackmen.

An emergency stock of light repair parts is carried at all maintenance points, the general store at Aurora, Ill., carrying a complete stock of all repair parts. All battery repairs are made at Aurora, where all crankcase oil is shipped in containers after 1,500 miles of service and reclaimed by the Gustin-Bacon distillate process at a cost of 11.2 cents a gal, as compared with 42 cents new. As necessary precautions due to the use of gasoline fuel, the cars are assigned to enginehouse stalls where fires and open flame lights can be kept away. All gasoline supply tanks are equipped with the Protecto-Seal device to eliminate any possible fire hazard. No welding is permitted about these cars and all maintenance forces are instructed in the safe handling of the equipment. No operation of the engine in closed buildings is permitted.

Relatively Few Delays Due to Failures

Delays to the equipment are reported as in regular train service, formal investigation being made in all cases where the delays exceed 30 min. When a car fails, the fact is recorded and a report by wire dispatched to the general office where arrangements are made for an investigation. At the end of each month, the failures are tabulated, analyzed and a mimeographed form sent out to all interested, with a view to preventing a recurrence of that type of failure. In cases where necessary, disciplinary action is taken, as in the case of regular steam-train service.

As is to be expected from the high percentage of availability, failures of gas-electric cars are few and far between, as shown in one of the tables. There were only 21 failures with 57 cars, making a mileage of 3,341,004 in 1930, or approximately 160,000 miles per failure. Another way of expressing it would be .031 failures per car per month.

The following is a typical failure report for the month of November, 1930:

Car No. 9727, Creston Division, Lost 1 Hr. 53 Min. November 1

Failure was attributed to connecting rod breaking in the crank end of rod, due to an existing fracture.

A sample of oil was taken from the crank case after failure occurred. Analysis showed oil to have a very dark appearance, which is evidence of considerable use between oil changes. It has been noted that the bearing of No. 3 rod which failed had been taken up the previous night and possibly pulled up too tight. This, together with the poor condition of the lubricating oil, probably resulted in the bearing becoming hot and gripping the crank pin, due to lack of proper lubrication, causing the rod to fail at the point of fracture.

This failure can be attributed to a combination of conditions, which could have been avoided if the following precautions were taken:

Extreme importance of careful inspection of reciprocating parts

Changing out lubricating oil regularly in order to avoid excessive use and dilution

Connecting-rod crank-pin bearings should not be pulled up too tight, but a clearance of .003 in. to .005 in. allowed on the diameter and a lateral clearance of .020 in. equally divided.

Motorman reports that he noticed an unusual sound in engine immediately after leaving the terminal but he continued operation in this condition for some time before failure of rod occurred. Had he stopped when the unusual sound was first detected and made careful inspection, he probably would have located the trouble, after which a relief engine should have been called and an expensive failure avoided.

Car No. 9811, Lincoln Division, Lost 3 Hr. 55 Min. November 8

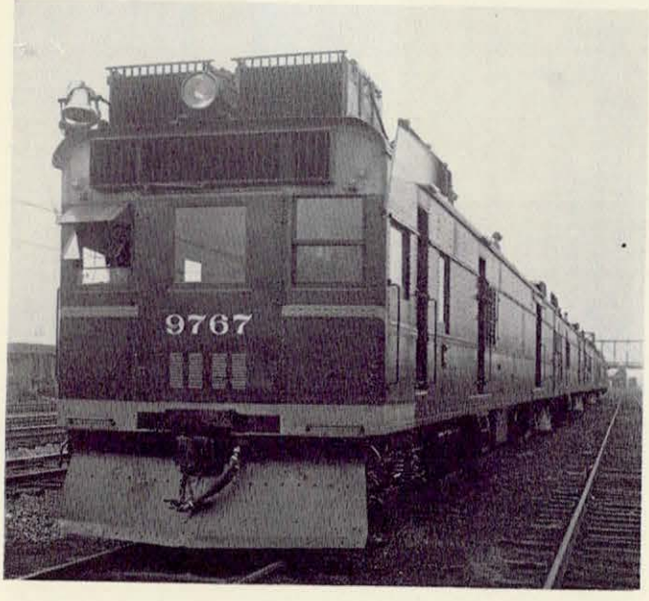
Failure due to piston breaking in No. 3 cylinder. It is impossible to make inspection of pistons unless cylinder head is removed and piston pulled. Fractures in pistons are most times produced by detonations caused by pre-ignition and by excessive heating of engine due to overload. Incorrect proportions of fuel components will also contribute to detonation by causing violent explosions when ignited instead of merely burning under high pressure as when properly proportioned. Detonation from this cause can be somewhat diminished by supplying water to the carburetors which injects a spray of moisture into the fuel mixture. This application has been made to a few of the cars in service, resulting in smoother operation and a considerable reduction in detonation under heavy loads.

Where detonation is present, check up on the magnetos and see that they are properly timed and synchronized. Also make sure that the power plant is not overloaded on account of excessive trailing load.

Enginemen and crews are instructed by district motor-car supervisors who spend their entire time in the field and are familiar with the condition of every car, as well as the qualifications of individual operators. Enginemen are provided with three bulletins, covering the general construction and operation of the equipment, and are required to familiarize themselves with the details. To assist in this educational work, the Burlington is now editing an up-to-date and revised pamphlet of pocket size for distribution to all maintenance and operating men. Individual instruction of enginemen and motor-train crews is found to give the best results. The supervisors are required to make periodical surprise checks to determine if the men are on the alert. The district supervisors also keep monthly statements of individual car performance, quantities of gasoline, lubricants and other supplies used. In case any of the cost figures appear excessive, the cause is determined and remedied, if possible. The ability of the crew is reflected in the performance of the car.

Failures With 57 Burlington Gas-Electric Cars in 1930

Date	Part Which Failed	Source of failure
January 11	Storage battery exhausted	Man
January 13	Water pipe frozen	Man
February 5	Traction-motor bearing burned out	Man
February 25	Insufficient pressure on gas tank	Man
March 6	Traction-motor bearing running hot	Mechanical
March 17	Oil-pump key sheared	Mechanical
April 22	Cylinder-head gasket blown out	Mechanical
April 29	Broken oil pipe to engine	Mechanical
May 3	Main battery fuse burned out—Motormen unable to locate	Man
June 23	Both magnetos failed	Man
July 5	Piston failed in engine	Mechanical
August	No failures	
September 3	Connecting-rod bearing burned out	Man
September 4	Loss of oil pressure due to sand hole opening in blocks under camshaft bearing	Mechanical
September 24	Connecting-rod bearing burned out	Man
October 1	Connecting-rod bearing burned out	Man
October 24	Connecting-rod breaking	Man
November 1	Broken connecting rod	Mechanical
November 8	Piston breaking	Mechanical
December 1	Gas sump frozen—Stopping flow of gasoline to carburetors	Man
December 3	Engine backfiring—Burned insulation from ignition wiring	Man
December 13	Batteries run down	Man



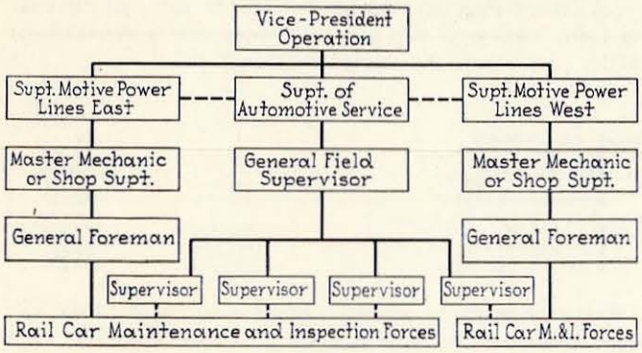
Five 400-Hp. Electro-Motive Cars Delivered to the C. B. & Q. in 1930

Maintenance Policy and Organization

The success of the Burlington in using gas-electric rail equipment may be attributed to its refusal to overload the motor cars (handle extra trailers of excessive weight), operate at excessive speeds (over 35 m.p.h. on branch lines and 50 m.p.h. on main line), and a deter-

mined effort to provide adequate lubrication at all times. Aside from these reasons, the most important single factor has been the general policy of effective inspection and maintenance, with a supervisory organization reporting directly to the operating vice-president, but co-operating fully with the mechanical department. The car inspection and maintenance forces are all on the mechanical-department payroll, reporting through their respective foreman, master mechanic or shop superintendent and superintendent of motive power to the vice-president of operation. The supervisory organization is comprised of a superintendent of automotive service, general field supervisor and four district supervisors, who are responsible for the condition and satisfactory performance of automotive equipment on the road. In addition to instructing and training maintainers and enginemen, this supervisory organization keeps records of individual car performance, decides when cars need shopping for heavy repairs and passes on the quality of repair work done at the shops.

The superintendent of automotive service makes recommendations regarding the details of new gas-electric car specifications, repair operations, tolerances, standards, etc. The district supervisors have access to the shops and inspection points to see that the work is properly carried out and to inspect and pass on all repair



Burlington Organization for Handling Rail Car Inspection and Maintenance

work before the cars are delivered to the transportation department.

The advantages of this supervisory organization as developed on the Burlington include a centralization of responsibility for the proper inspection, maintenance, distribution and assignment of gas-electric cars; direct action in case of emergency; district supervisory force unhampered in determining facts and reporting them; consequent prompt correction of any undesirable conditions; and the tendency to assure a consistently high standard of inspection and maintenance work.

Handling Heavy Repairs

Heavy repairs to 41 gas-electric cars on the Burlington are handled at the main locomotive shops, West Burlington, Iowa, for lines east, and heavy repairs to 16 cars at the locomotive shops at Havelock, Neb., for lines west. No definite mileage is set as a goal to be attained between shopping dates for heavy repairs. The general policy is to keep the cars in service until the cost of running repairs becomes excessive and the engine and electrical equipment require a thorough overhauling. The mileage may vary between 150,000 and 230,000, accumulated in a period of 18 months to two years, depending upon the severity of the service and track conditions on the divisions where the respective cars operate.

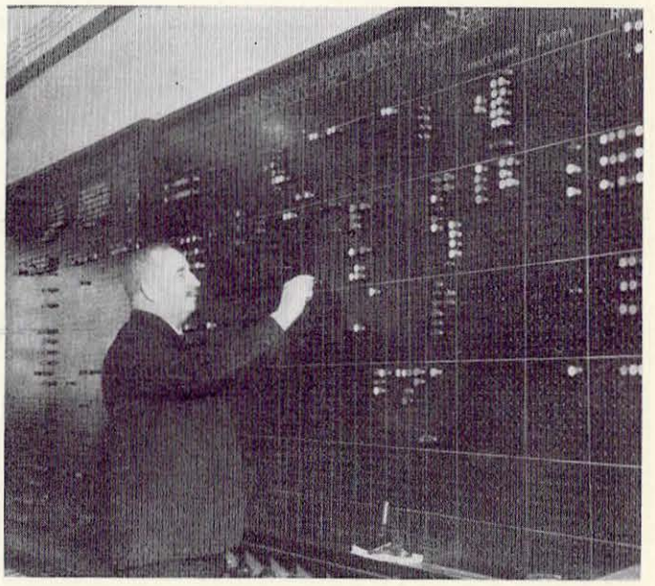
The most severe service in a gas-electric car is sustained by the prime mover and about one month before the supervisor of automotive service determines from reports that a general overhauling of the power plant and car is desirable the mechanical department is notified of the desired shopping date, with a copy to the transportation department, which arranges for replacement of the car and its movement to the shop. The mechanical department is also given a detailed report of the work necessary and the material needed for replacement or repairs. A copy of this report is sent to the stores department sufficiently in advance of shopping of the car to prevent delays due to waiting for material.

Cars are usually scheduled for heavy repairs so that one or two cars are in the back shop all the time, thus permitting the steady operation of a specialized gang which has become expert on rail-car work. Repair men work two eight-hour shifts on all cars. In this way, the gas-electric cars are overhauled and returned to service with the least possible delay. In fact, this principle is applied to all phases of gas-electric car inspection and maintenance, as the earnings of the equipment are substantial and directly proportional to the miles run.

Keeping Track of Trains

THE Northern Pacific makes use of an effective means of keeping track of the movement and consist of its passenger trains. This takes the form of a huge blackboard, evolved by the general superintendent of transportation and occupying a prominent place in his office. A glance at this board at any time shows the consist of each train, the number of cars and their type. The location of the train requires only another glance at the train sheet, which records by telegraph the movements of the various trains.

The system provides a peg for each car. It is properly marked, bearing the name or the number of the car. Just before a train on the system is set in motion and after orders have been given for its makeup, the proper pegs are placed side by side in the blackboard. If the train requires 10 cars, 10 pegs are in the blackboard train. Along the line, at proper designations, are the additional cars which will be required for the train.



The Consist Indicating Board of the Northern Pacific

When the train sheet shows that the train has reached a point where its consist is to be changed, the blackboard train is changed accordingly, with pegs removed or inserted.

On the blackboard at one time there are as many as 26 through trains operating between St. Paul and the Pacific coast and 90 branch line, local and special trains. The blackboard and train sheet combination enables the transportation officers to visualize train operation on the entire system at a glance.

More than 1,000 units of passenger train equipment are required for the service. One section of the board is given over to pegs which indicate available cars and their location at various points. If a sharp unexpected increase in passengers should develop at any point along the system, it is necessary only to look at the board and order into service additional equipment which is available at a point which the train is approaching. The equipment is distributed at all times so that such an emergency may be met without delay. Every unit of passenger equipment can be checked and located within 20 minutes. There have been times on the Northern Pacific, as on other railroads, when it has been necessary in emergencies to "spot," at a specific point, an entirely new train and order it in motion to substitute for a regular train. This blackboard and train sheet arrangement permits the assembling of this train within a comparatively few minutes. If the train requires a mail car, baggage car, coaches and Pullmans, the pegs in the blackboard will show their availability and location.

Freight Car Loading

WASHINGTON, D. C.

REVENUE freight car loading in the week ended February 14 amounted to 720,689 cars, a slight increase as compared with the week before but a decrease of 172,451 cars as compared with the corresponding week of last year. As compared with 1929 it was a decrease of 236,809 cars. Reductions as compared with both years were reported as to all commodity classifications and all districts. The summary, as compiled by the Car Service Division of the American Railway Association, follows:

Revenue Freight Car Loading

Week Ended Saturday, February 14, 1931

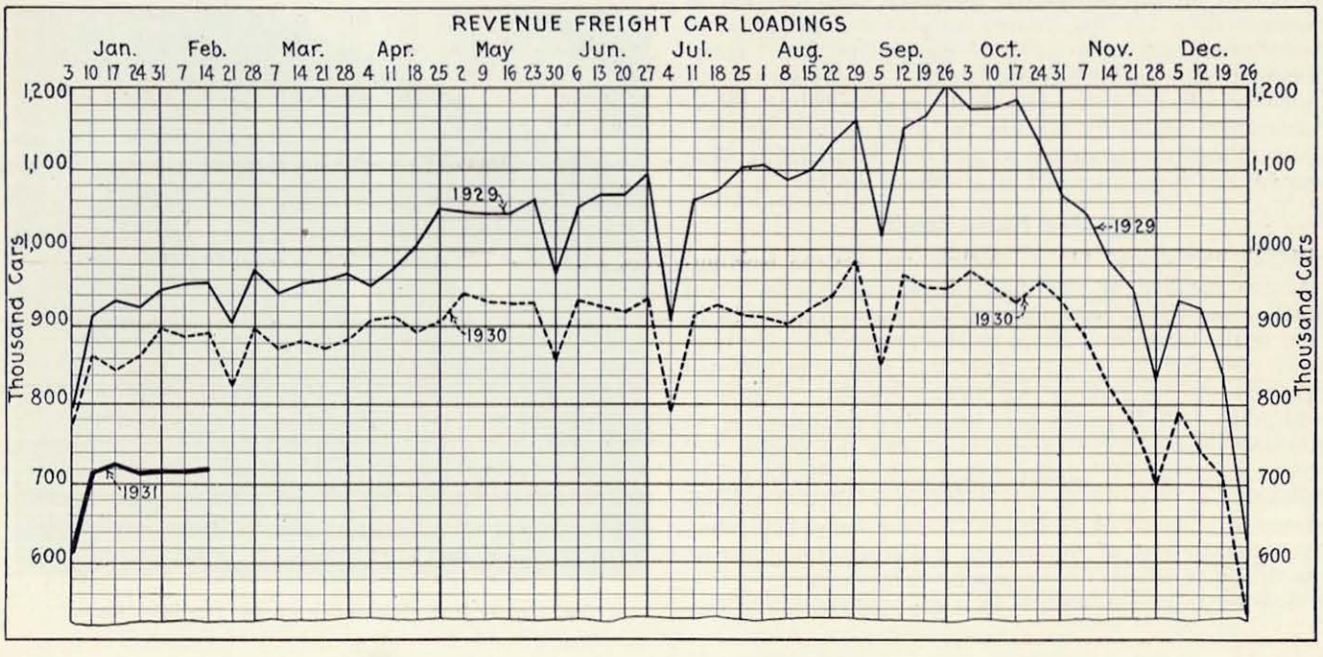
Districts	1931	1930	1929
Eastern	168,400	203,451	226,959
Allegheny	143,479	179,890	193,423
Pocahontas	43,658	56,521	59,015
Southern	112,268	141,536	148,405
Northwestern	87,964	107,309	113,538
Central Western	105,936	129,536	140,632
Southwestern	58,984	74,897	75,526
Total Western Districts	252,884	311,742	329,696
Total All Roads	720,689	893,140	957,498
Commodities			
Grain and Grain Products	41,279	44,734	47,153
Live Stock	23,046	25,888	26,879
Coal	148,209	180,987	211,750
Coke	9,192	11,674	13,599
Forest Products	34,899	59,216	61,524
Ore	5,899	8,905	9,605
Mdse. L.C.L.	212,610	239,432	248,570
Miscellaneous	245,555	322,304	338,418
February 14	720,689	893,140	957,498
February 7	719,053	886,701	955,981
January 31	719,281	898,835	947,154
January 24	715,690	862,346	926,474
January 17	725,938	847,155	931,861
Cumulative total, 7 weeks	4,930,284	6,026,393	6,432,088

Car Loading in Canada

Revenue car loadings at stations in Canada for the week ended February 14 totaled 48,157 cars, an increase of 1,201 cars over the previous week and a decrease of 9,015 cars from the same week last year.

	Total Cars Loaded	Total Cars Rec'd from Connections
Total for Canada		
February 14, 1931	48,157	29,181
February 7, 1931	46,956	29,360
January 31, 1931	47,139	28,815
February 15, 1930	57,172	38,617
Cumulative Totals for Canada		
February 14, 1931	317,295	189,614
February 15, 1930	384,459	252,441
February 16, 1929	411,309	279,890

AUGUST ABENDROTH, retired foreman in the shops of the Chicago, Milwaukee, St. Paul & Pacific, at Milwaukee, Wis., now 82 years old, is credited with having served in the car department of that road for 47 years without sustaining any serious bodily injury; and the 13 men who worked under him in the shops, for periods aggregating 224 years, had during that time but one injury sufficient to figure in the accident record. That one item was caused by a man stepping on a piece of glass.

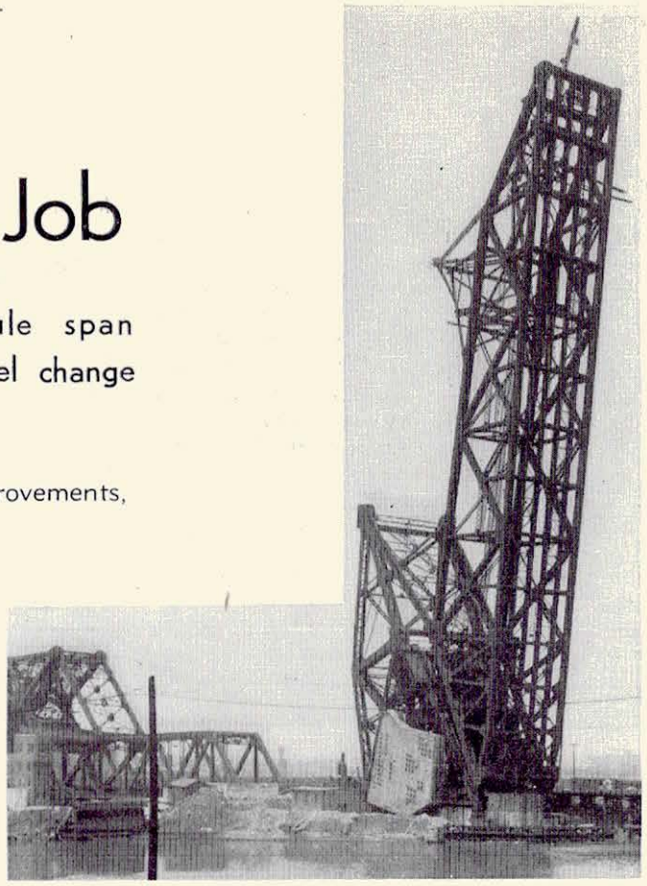


A Complex Bridge-Moving Job

World's longest single-leaf bascule span shifted 400 ft. to accommodate channel change

By C. H. Mottier

Engineer of Design, Chicago Terminal Improvements, Illinois Central



Dismantling the St. Charles Air Line Bridge —The Structure Was Re-erected to the Left of the B. & O. Bridge in the Background

THE straightening of the south branch of the Chicago river between Taylor and Eighteenth streets, gave rise to a number of difficult and expensive contingent projects by the railroads that own property and trackage in the territory affected. Of these, the moving of the St. Charles Air Line bridge, a double-track single-leaf Strauss bascule span built in 1920 at a cost of $705,000, was of an outstanding character. Until it was shortened to fit the site to which it was moved, this was the longest single-leaf railroad bascule bridge in the world, the movable leaf being 260 ft. long. When in the open (vertical) position, the span extended to the normal height of a 24-story building.

The bridge is an important element in the property of the St. Charles Air Line, which functions as an interchange railway about three-fourths of a mile long, located just north of Sixteenth street and connecting the Illinois Central and the Michigan Central on the lake front with the Chicago & North Western and the Chicago, Burlington & Quincy, just west of the South branch of the Chicago river. The line is owned equally by the four railways it serves, and is operated and maintained by the Illinois Central.

Two Interrelated Projects

The straightening of the river resulted in the shifting of the channel a distance of about 400 ft. to the west at the location of the Air Line crossing, as may be observed in the aerial photograph of downtown Chicago looking northeast from near Twenty-second street. In the lower center of the picture may be seen the St. Charles Air Line crossing the old filled channel and the bridge being re-erected on the west side of the new channel. Further to the left, the line is seen to cross over tracks that parallel the new channel. This overcrossing indicates the present stage of a project for the separation of grades of the Pennsylvania, the Baltimore & Ohio, the Burlington and the North Western which is closely interrelated with the project for moving the Air Line bridge to its new location.

The straightening of the river channel, which was carried out in an efficient manner by the Department of Public Works of the city, involved the assessment of benefits and the award of damages to the owners of adjacent property and under this arrangement the city allowed the Air Line $425,000 to compensate it for moving its bridge from the old to the new channel or, if preferred by the railroad, for constructing a new bridge across the new channel. Many different schemes for meeting the situation were considered. Up to a certain moment navigation was to be maintained in the old channel and then switched without interruption to the new channel. This required the Air Line to maintain movable bridges over both channels, which was a very important obligation, as a temporary movable bridge, even with a restricted opening, could not be built over either channel for less than $150,000. The problem was solved by a temporary interchange of use of the Air Line bridge and one built by the Baltimore & Ohio as outlined below.

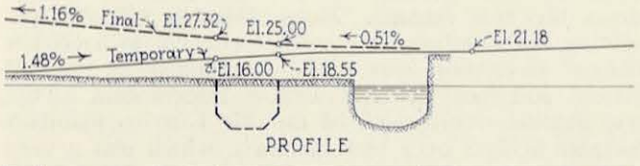
Make Use of Two Bridges

The B. & O. was required to build a new bridge across the straightened channel immediately north of the new Air Line bridge and an arrangement was made with the B. & O. whereby its bridge was placed in a position that would permit its use temporarily by the Air Line for crossing the new channel. This situation is shown in Fig. 1. The Air Line was single-tracked during construction operations, which made it possible to use the then existing Air Line bridge as a crossing of the old channel and the B. & O. bridge as a temporary crossing of the new channel. This operation was continued until after navigation was transferred from the old to the new channel. It was then possible to drive a temporary trestle across the old channel, as shown in Fig. 2. This released the Air Line bridge so that it could be moved to its new position over the new channel.

An Aerial Photograph of the River Change—Light Area in the Center Is the Old Channel Filled In, St. Charles Air Line Crossing in the Middle Distance, Chicago's "Loop" in the Background

Photo Courtesy L. D. Gayton, City Engineer, Chicago

Thus, the construction of the B. & O. bridge was one of the first steps necessary in connection with the river-straightening project. The roads involved in the grade separation near Canal and Sixteenth streets had not as yet agreed on the grade separation plan. But in view of the requirements of the river-straightening project, the B. & O. could not wait until the grade separation problem was settled, and built its bridge on a low grade line



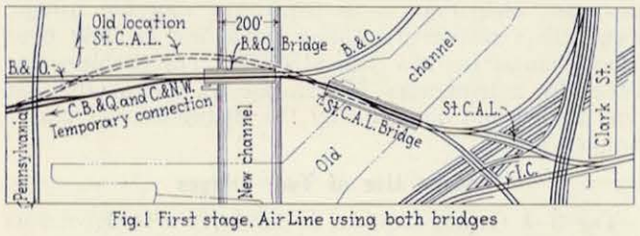


Fig. 1 First stage, Air Line using both bridges

Fig. 2 Air Line using temporary trestle and B. & O. bridge while Air Line bridge was being transferred to new site

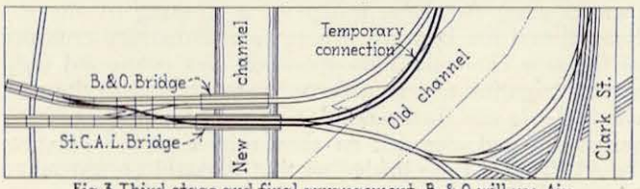


Fig. 3 Third stage and final arrangement—B. & O. will use Air Line bridge while its own bridge is being raised to final grade

Sequence of Traffic Shifts Required for the Bridge Transfer

determined by the perpetuation of the grade crossing between the B. & O. and the Pennsylvania 575 ft. west of the new channel.

After the bridge was completed and placed in operation it was decided definitely to go ahead with the grade separation, which required that both the Air Line and B. & O. bridges be built at a higher elevation than that adopted initially for the B. & O. bridge. Because of this situation it was decided to raise the Air Line bridge to the higher grade line dictated by the requirements of grade separation, and as shown on the profile. After the Air Line bridge is placed in operation, which will be done as early this year as weather conditions will make track work practicable, the B. & O. will make a temporary connection to the Air Line bridge as shown on Fig. 3. The B. & O. will then proceed to raise its bridge to the final high grade line elevation and complete the west approach, after which the B. & O. traffic will be transferred back from the Air Line to the B. & O. bridge.

Bridge Was Shortened

The Air Line bridge, in its new location, being at right angles to the river, needed to be only 220 ft. long instead of its original length of 260 ft. This required the shortening of the movable leaf and a corresponding reconstruction of the counterweights and counterweight trusses. The shortening operation was accomplished by cutting out one panel of the bridge, as shown in Fig. 4. This shortening of the movable leaf, as well as the remodeling of the counterweight truss, was accomplished during the moving operations.

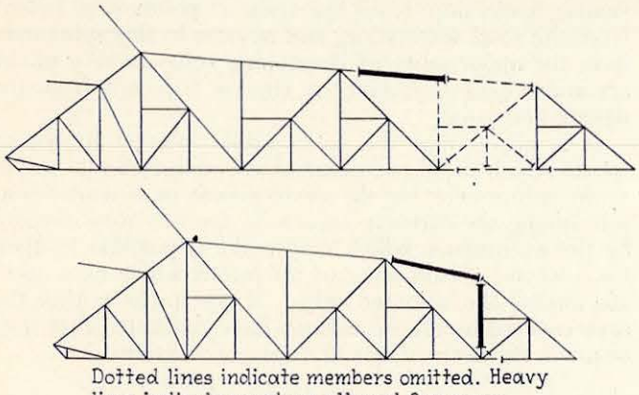
In calling for bids for moving the bridge, the railroad outlined two alternate methods that might be followed. The contractor was permitted to submit a proposal on either or both methods. One of the methods contemplated the complete dismantling and re-erecting of the structure. The other was based on moving the bridge by the flotation method which was to be accomplished in two operations, the movable leaf to be floated on two barges from its original position to a temporary location, and later from the temporary location to its final position.

The shortening of the span was to be accomplished while the movable leaf was stored in the temporary location. The second operation involved floating the A-frame and a part of the counterweight truss from the old to the new position.

Five bids were received, four based on the flotation method and one on the dismantling and re-erecting method. The low bidder, the Strobel Steel Construction Company, elected to use the dismantling and re-erecting method, and the contract for the work was awarded to and executed by that company.

Trouble with Sticking Pins

The dismantling of the bridge required approximately four months. Considerable difficulty was experienced in removing the pins. At first the usual method of hitting the pin with a ram was employed, but as this was not effective on some of the larger pins, a method was devised by which a framework was so constructed that jacks could be made to bear against the pin. This method worked effectively on all but one 16-in. pin that was retained within a steel collar. This pin was not designed to move within this collar, and a rust seal had developed that made it impossible to remove the pin from the collar, even after 120 tons pressure had been exerted on the pin. As this was the maximum pressure that could



Dotted lines indicate members omitted. Heavy lines indicate members altered for reuse

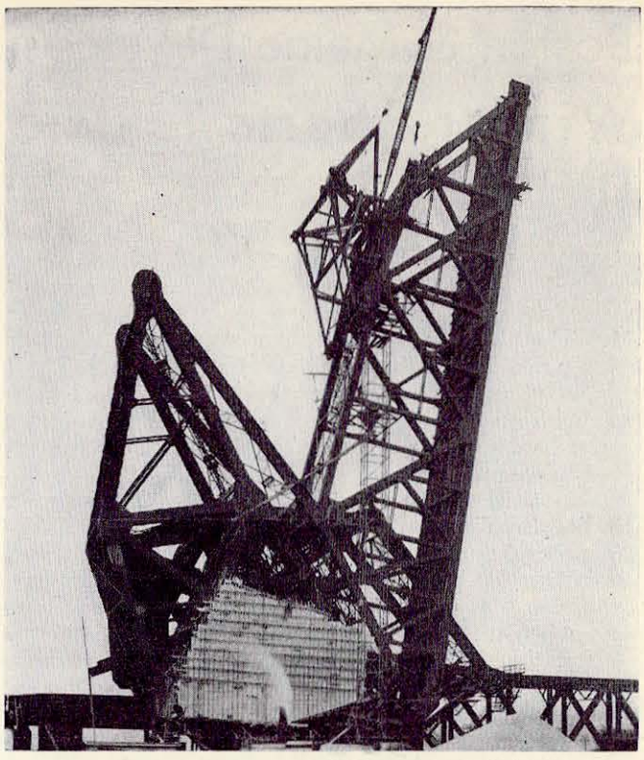
How the Trusses Were Shortened to Fit the New Span Length

be applied to the pin in the field with safety it was desided to dismantle this particular member and send the pin and collar, together with the gusset plates attached to the collar to the Illinois Central's shops at Burnside, (Chicago) where the pin was placed in a hydraulic press capable of developing 700 tons pressure. This pressure was sufficient to remove the pin.

After the surface of the pin had been cleaned with emery paper a trial demonstrated that the weight of the pin was sufficient to force it vertically through the steel sleeve without the application of any additional force. This showed the tremendous grip that had been developed by the rust seal. In the re-erection operation this particular pin was driven home in its horizontal position with no special effort, the operation being accomplished in less than 10 min.

Rapid Progress in Re-erection

The re-erection of the steel for the bridge was performed in 10 weeks, which is a record time for a structure of this type. The method adopted by the contractor in both dismantling and re-erection did not involve the use of falsework. The dismantling of the movable leaf was accomplished by means of a traveler erected on the upper chords of the truss. After the upper portion of the movable leaf had been removed, a derrick located on



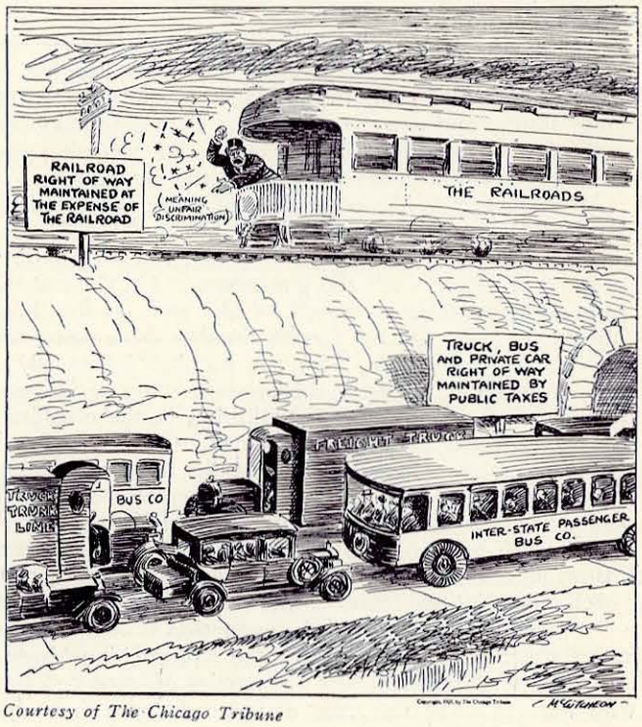
Re-erecting the Bridge on the New Site—B. & O. Structure in the Rear

the top of the A-frame removed the bottom portion of the movable leaf and the counterweight trusses. The A-frame was then removed by a derrick set up on the ground. Reverse operations were followed in the re-erection.

This project was handled for the Air Line by the Chicago Terminal Improvement organization of the Illinois Central.

* * *

THERE SEEMS TO BE SOMETHING IN WHAT HE SAYS


RAILROAD RIGHT OF WAY MAINTAINED AT THE EXPENSE OF THE RAILROAD
(MEANING UNFAIR DISCRIMINATION)
THE RAILROADS
TRUCK, BUS AND PRIVATE CAR RIGHT OF WAY MAINTAINED BY PUBLIC TAXES
BUS CO
INTER-STATE PASSENGER BUS CO.

Courtesy of The Chicago Tribune

Boston & Maine Develops Winter Sports Traffic

BELIEVING that the opportunities for winter sports available within a few miles of Boston, Mass., are equal to those to be found at the more distant regularly developed winter resorts, the passenger traffic department of the Boston & Maine inaugurated a series of one-day outing excursions on Sunday, January 11. The plan for the excursions was developed in co-operation with the Appalachian Mountain Club of Boston, an organization of winter sports enthusiasts, and has met with an immediate response which has steadily increased with each successive Sunday since the first excursion was run.

The plan is to select a new destination for each succeeding Sunday's outing within a maximum distance of 150 miles from Boston and a round-trip fare not to exceed three dollars. The destination of each Sunday's excursion is not determined until the preceding Thursday, when, after a study of meteorological reports in consultation with representatives of the Appalachian Mountain Club, a destination is selected at which favorable weather conditions seem most likely to prevail and where snow and ice conditions are good for snowshoeing, tobogganing, skiing, sleighing and skating. The six excursions which have been run so far this season have been to points in southern New Hampshire, ranging from 64 miles to 125 miles distant from Boston. The rates for the round trips ranged upward from two dollars for the distances under 100 miles to two dollars and fifty cents and two dollars and seventy-five cents for the longer distances. The trains leave Boston at 8:30 a. m., and, returning, depart for Boston at about 6:15 p. m.

The trains usually consist of a combination coach and baggage car, as many coaches as are required to accommodate the patrons, a dining car and a club car. The train is parked at the destination throughout the day, in charge of the crew, so that patrons may return to it at any time to patronize the dining car, to rest, or to dry out wet clothing, and surplus equipment may be left aboard if desired.

Special menus are provided on the dining cars for the snow sports train, including club breakfasts ranging in price from twenty cents to one dollar, a one-dollar table d'hote dinner and a la carte service. Provision has been made for a continuous buffet service of refreshments, such as soft drinks and ice cream, in the lounge car.

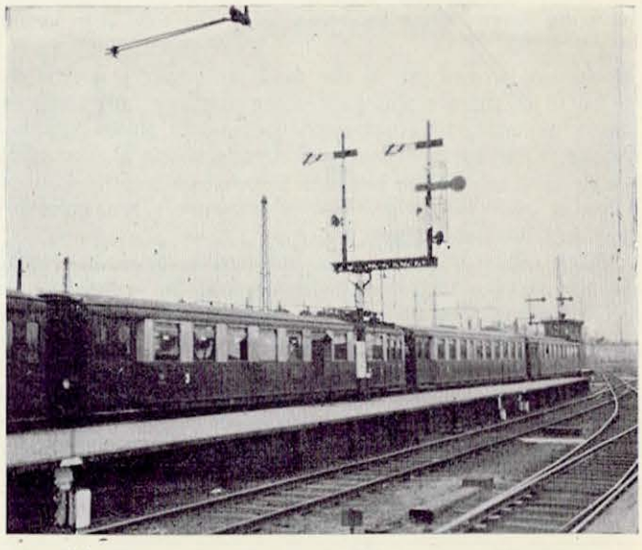
An indication of the popularity of these excursions is the increase in patronage which they have enjoyed. Beginning with the first excursion which ran on Sunday, January 11, there were 196 passengers. On the second Sunday the number increased to 237, and, on the third Sunday, to 367. On the fourth Sunday there were 320 passengers, and on the fifth the number increased to 650. For this excursion it was necessary to provide two diners and eleven coaches, in addition to the combination baggage car and the lounge car. On February 15 it was necessary to provide three trains to accommodate 966 excursionists. In addition to its own advertising of these trips, the Boston & Maine has had the benefit of considerable additional publicity in the advertising of Boston stores selling sports equipment and clothing, as well as editorial comments in the local newspapers.

An interesting feature of the excursion is the arrangements which have been made by the Appalachian Mountain Club to provide leaders for parties of expert skiers who wish to leave the train at some distance from its final destination and travel cross-country to the destination point. Other parties of those less expert, under similar leadership, leave the train at points less distant from the final destination, and novices in this sport may have the opportunity of developing some facility in the art under expert guidance in shorter trips out from the destination point.

Leaving the Winter Sports Special for a Day in the Open

It is hoped that the wide public interest in winter sports which these excursions have indicated may serve as an inducement for the development of a winter season among the summer resorts in the territory covered by the excursions, which may make it possible to open for a winter season some of the hotels which now operate during the summer only. Many towns within the area covered by the excursions have requested that they be made the destinations of future excursions.

* * *



At the Rotterdam Station of the Dutch Railways

Electrification on the railroads of Holland includes 168 track miles, operated on a 1,500-volt direct current system with the chord type of catenary construction. There are 242 multiple unit cars in use, while both installation and equipment are modern and high grade, according to a report by G. I. Wright and A. T. Dice, Jr., of the Reading. Motor cars are equipped with four 200 hp. motors, haul trailers, and have a balancing speed of 60 m. p. h. Electrification of the Dutch railways, where traffic requires fast trains at frequent intervals, and where there is extensive competition from private motor coaches and trucks and canals, has proved successful both from an operating and financial viewpoint.

Control of Railroads Analyzed for House Committee

Legislation recommended to bring all acquisitions under I. C. C. jurisdiction

WASHINGTON, D. C.

PROMPT legislation to prevent additional acquisition or common control of railroads, by holding company or otherwise, faster than the Interstate Commerce Commission can get around to expressing its approval or disapproval, and later consideration of further retroactive legislation to prevent "some obstinate interest" from holding a strategic railroad indefinitely, which the Interstate Commerce Commission might prefer to allocate elsewhere and thus retarding the process of "desired and orderly consolidation," are the principal recommendations made in a 1700-page report submitted to the House committee on interstate and foreign commerce on February 20 by Walter M. W. Splawn. Dr. Splawn was retained as special counsel for the committee to conduct an investigation of railroad ownership and control, with particular reference to holding companies, investment trusts, etc., under a resolution adopted by the House following recommendations by the Interstate Commerce Comission that Congress look into the matter with a view to possible legislation.

The specific recommendations are:

I. It is respectfully recommended for the consideration of the committee, first, that paragraph (2) of section 5 of the interstate commerce act, as amended, be amended so as to bring within the jurisdiction of the Interstate Commerce Commission for approval or disapproval any acquisition of the control of a railroad which would result in bringing that road into affiliation with, in control of, or under the management of another railroad, whether the acquisition be by holding company or otherwise.

II. Second, that at the next session of the Congress the committee shall give consideration to whether or not legislation is necessary to deal with any past acquisitions of railway properties such as are disclosed in this report, and which have not had the approval of the Interstate Commerce Commission as being in the public interest.

III. Third, that the scope of the investigation authorized by House Resolution 114 be broadened to include all holding companies engaged in interstate commerce.

A resolution to carry into effect the first recommendation was introduced in the House on the following day by Chairman Parker of the committee.

Such legislation would not be merely to close the stable door after the horse had been stolen, Dr. Splawn suggests, because not all of the horses have yet been taken, and there are rumors of activities west of the Mississippi river analogous to those in the East. The report notes that the Southern Pacific Land Company has acquired 24.79 per cent of the stock of the St. Louis Southwestern and that the Virginia Transportation Company, one of the Van Sweringen mediums, is one of the substantial holders of Chicago Great Western stock.

No conclusions have been reached as to whether federal regulation of the holding company is necessary or desirable but it is proposed to spend several months on a study of that subject and the third recommendation that the scope of the investigation be broadened to include all holding companies engaged in interstate commerce, is made so that it may be co-ordinated with the investigation of public utility companies now being conducted for the Senate by the Federal Trade Commission.

The report is probably the most comprehensive compilation and analysis of statistical and other data concerning railroad ownership and control that has ever been made, accompanied by a series of studies as to the power of Congress to regulate stock ownership in railroads and as to whether the holding company should be outlawed or regulated. The very wide distribution of the ownership of railway stocks is repeatedly emphasized in the report, which states also that "large individual or family holdings of railroad securities appear to be quite limited," leading Chairman Parker to declare in an address to the House that:

"The ownership of railway stocks is in the hands of a multitude of American citizens." The conclusion is reached that "the investment trust as such is not a factor in railroad control," and the report discloses that the large banks and investment banking and brokerage houses together own only 5 per cent of the total outstanding stock of all Class I railroads.

The report was transmitted to the House and made public on the same day it was furnished to the committee, as a "preliminary progress report," to be followed by other parts. After the committee has considered the findings and held hearings on the pertinent questions as they develop during the course of the investigation the committee will submit its recommendations for legislation. Meanwhile Chairman Parker, in an address to the House regarding the findings already made, personally urged enactment of the proposed amendment to Section 5 at this session. There was no expression from the committee itself.

Although the investigation resulted from the activities of the Van Sweringen interests and the Pennsylvania in acquiring control, largely through holding companies, of strategic railroads which have been allocated to other systems in the Interstate Commerce Commission consolidation plan, no general criticism of holding companies is included in the report. It points to activities of certain companies as tending to interfere with "the process of desired and orderly consolidation" under the direction of the commission and, in marked contrast to the recent report by the special counsel for the Senate committee, the tone is distinctly favorable to continued progress in the direction of merging the railroads into a limited number of systems. For this purpose the holding company is viewed as in many ways a useful institution.

Information in the report relating to holding companies, Mr. Parker said, reveals that in general "holding companies in the railway field are merely used for convenience in tying subsidiary corporations in with the parent companies," and "in only a few instances," he said, "have there been notable activities such as those which provoked the complaint of the Interstate Commerce Commission." Mr. Parker also said that "most of these acquisitions of control through the device of the holding company about which the commission has com-

plained will soon be submitted to the commission in connection with application for four dominant systems in eastern territory."

Fourteen Major Groups Seen

Although the ownership is widely distributed the report finds that acquisition of control of railroads has already proceeded at such a rate that 210,000 miles of line, or nearly 85 per cent of the railway mileage of the country, is now controlled by 14 major groups, whereas the Interstate Commerce Commission consolidation plan proposes 19 railway systems, aside from those controlled by the two Canadian systems. It is also shown that 16 Class I railroads and 46 subsidiaries control 146,465 miles or about three-fifths of the total railway mileage.

Over 350 pages are devoted to a special report of an investigation of the complicated intercorporate relationships of the Van Sweringen group, which is credited with control of 28,631 miles, whereas the Great Northern-Northern Pacific group is credited with 27,421 miles and the Pennsylvania group with 23,498. The next largest is the Southern Pacific, with only 14,484 miles. There are also 200 pages on the Pennsylvania activities and about 150 on the Great Northern-Northern Pacific.

Taking up its recommendations in order the report says that if paragraph (2) of Section 5 were amended so as to require those seeking acquisition of control of railroads to obtain the approval of the Interstate Commerce Commission before such acquisition were lawful, there would likely be in the future no further cause for complaint such as that made by the commission to Congress in its annual report of 1929. If such an amendment be drawn, it should be made clear that while it refers to acquisitions which will take place after the enactment of the amendment, it would in no way give immunity to anyone for a violation of existing laws by reason of any acquisition prior to the effective date of the amendment.

"It would appear sensible first to close the doors of the stables still occupied before going in search of horses which have been removed," the report says. "There have been certain developments in the West which are causing some railway managements to seek new connections and additional affiliations for their roads.

"There are two outstanding recent developments which appear to have an unsettling effect on the railroads in the West. These are, first, the acquisition of the Missouri-Pacific lines by the Van Sweringen interests; second, the proposal under the plan for four systems in the east to extend those eastern systems to the Missouri river gateways. The near future may bring other developments which may stimulate certain interests to seek control of railway properties in the west or in other sections of the country. It is not correct to conclude that all has already happened which could take place in acquiring control of railroads without the approval of the commission."

It is suggested that consideration of whether or not legislation is necessary to deal with past acquisitions of railroads without the commission's approval may be deferred until the next session of the Congress. This for two reasons: First, if such legislation should be found necessary the attempt at its formulation would provoke extensive hearings, and the difficult and delicate questions involved would require most careful and mature deliberation. The second reason is that under the reported proposal to form four systems in eastern territory practically all the acquisitions at which such legislation would be directed will be submitted to the Interstate Commerce Commission in connection with the applications for the approval of the four proposed systems. It is conceivable that as the result of these proceedings legislation looking toward compelling divesture of control by any particular interest where the commission had not given its approval would be made unnecessary. By the time the Congress convenes for the next session events will have doubtless transpired which will reveal whether or not the Congress will have to increase the powers of the commission with reference to past acquisitions of control about which the commission has complained.

The third recommendation is made because the holding company as an agency in interstate commerce is not confined to railway transportation. In fact, the use of the holding company has been more varied in other fields. Before deciding whether or not to regulate the holding company in certain of its uses and/or abuses in interstate commerce, it seems that the committee should be fully informed as to the exact nature of this device, as to whether or not its uses vary from one line of business activity to another and as to what are its economic advantages and disadvantages with respect to each character of business in which it is used.

If Federal regulation of the holding company is necessary, the reasons for that necessity should be clear, the evils to be remedied should be apparent, and the scope and the limits of desired and possible federal control should be clearly set forth. Necessary protection should be afforded, in so far as it is possible under federal regulation, to those who would otherwise suffer without interfering with or placing undue burdens upon legitimate and desirable business activity. Formulation of such legislation will require a comprehensive and prolonged study by this committee as preparation for the extensive hearings.

Broader Study of Holding Company Now Proposed

The investigation conducted for the committee has been directed according to the report:

(1) To the possibility of unification or consolidation of railroads without the approval of the commission.

(2) To the holding company as an instrumentality which may be used in the manner described by Commissioner Eastman, and in other ways.

"It soon became apparent that it would be impossible to complete both lines of investigation by the time the Seventy-first Congress reassembled for the short session. It seemed possible to finish the investigation of ownership of railroads to the extent necessary to enlighten the Congress as to whether or not there should be further legislation with reference to the acquisitions of control of railway properties. Again, from the activity in acquisition of control in certain areas of the country, particularly the eastern territory, it seemed desirable that the Congress should be in a position to act with reference to those matters at the earliest possible date. It was obvious that the study of the holding company as an instrumentality in interstate commerce could not be completed by January, 1931. For this reason it was decided to press the first part of the investigation to a conclusion by the time the Congress reassembled, so that it would be in a position to act with reference to extending the jurisdiction of the commission to include acquisitions of control of railroads by nonoperating companies." As a result of this policy, the committee has before it a completed study bearing on the first problem. The other study can be finished only after several months of further investigation.

While the investigation has been conducted at an expense of something less than the $50,000 appropriated by Congress for the purpose, it is stated that it has cost the companies investigated several times that amount.

The report shows that while Congress and the commission were delaying "certain great systems, particularly in the East, developed intensive rivalries of interest with reference to the acquisition of certain strategic railway properties" which eventually led to anti-trust law proceedings by the commission to prevent some of the systems from getting control of lines "which might not go to them in an orderly consolidation proceeding" and that "the commission finally brought to the attention of Congress that certain carrier interests were apparently getting desirable properties through acquisition of control by affiliated but non-operating companies."

The investigation conducted under House resolution No. 114 has established that the commission was correct in its belief that certain railway systems are in desperate competition for strategic properties, particularly in eastern territory. The acquisitions of such holding companies as the Pennroad Corporation and the Alleghany Co. are notable instances. If these groups were called, they would doubtless in each case assert that they had made these acquisitions for the purpose of ultimately presenting to the commission for its approval a "set-up" of railway properties which each respective group would desire to have approved as a unification in the public interest.

Conceivably some obstinate interest might hold a strategic railroad indefinitely and thereby greatly retard the process of desired and orderly consolidation. Such an interest might plead

in justification of its activity that consolidation should be gradual. Gradual consolidation contemplates applications to the Interstate Commerce Commission, careful consideration of well-prepared records, and adjustments and modifications of systems in the light of experience. The mere holding of important railway property in order to attain some private profit is not the same thing as a gradual consolidation, but is rather an arbitrary interference with any sort of consolidation, and involves a refusal to permit an inquiry as to whether the particular acquisition is or is not in the public interest. Regardless of the intent or motive which might be alleged, the commission was correct in its fear that the effect of these acquisitions of control by non-operating companies not within its jurisdiction would be so to entrench particular interests in so far as particular properties are concerned that consolidation might perhaps in effect be accomplished without the approval of the Congress. Certainly the difficulties would be so increased as to make it well nigh impossible to bring about the agreement necessary to an orderly and satisfactory unification of railway properties in eastern territory. What has been done in the East could easily be duplicated when there might be provocation in any other part of the country.

The holding company has lent itself as a convenient instrumentality in this terrific struggle between the railway giants of the East over coveted properties. An amendment to paragraph (2) of section 5 can be drawn so as to bring these holding companies under the jurisdiction of the commission in so far as they seek acquisition of control of railroads. It seems that such an amendment should be passed with promptness. It need not wait upon legislation concerning other phases of holding company activity.

The report falls into the following parts:

First, the study of "The constitutional power of Congress to regulate stock ownership in the railroads engaged in interstate commerce."

Second, the study of "Should the railway holding company be outlawed?"

Third, analyses of statistical and other data gathered concerning the ownership of railroads.

Fourth, findings from investigations made by expert accountants of the books and records of a number of holding companies.

Fifth, historical sketches of a few notable holding companies.

Sixth, an alphabetical list of officers and directors of the railroads of the United States, showing in each case the other companies in which a particular person is also an officer or director.

Seventh, appendixes.

In addition to those employed out of the appropriation made available to the committee arrangement was made with the Interstate Commerce Commission under which some of its best technical men were loaned for this investigation. A number of the commission's most expert accountants were detailed to search the books and records in the offices of holding companies. The statistical work was done for the most part in the offices of the commission through the collaboration of employees of the committee and those loaned by the commission.

Summarizing the discussions as to the first two parts the report says:

The Power of Congress to Regulate Stock Ownership

Federal incorporation offers but little as a solution of the problem of regulation of stock ownership in railroads engaged in interstate commerce.

Very little can be hoped for from federal regulation of interstate transactions in corporate securities.

It is believed that stock ownership may be an interference with or an obstruction to the exercise by Congress of its power to regulate interstate commerce, as it has now undertaken to do.

If the policy of an act warrants interference with stock ownership at all, there is ground for believing that it may put restraints on individuals in that regard.

(*a*) If a contemplated statute prohibited future acquisition of railroad stock in certain lines by certain classes of persons except on approval by the commission it might prohibit without like approval the holding after a fixed date of stocks lawfully acquired under present law.

(*b*) Congress has recognized in the Clayton act that voting may be an offense when passive stock ownership for investment is not.

(*c*) It would appear that some tests of the public interest should be specified by the Congress.

(*d*) Assuming a holding company to be sufficiently related to interstate commerce through its stock interests in railroads to justify congressional regulation at all, the power to investigate and to require reports follows as a matter of course.

(*e*) The condemnation of stock interest is new ground in legislation, and the present state of the authorities does not warrant prediction with assurance that it will have final acceptance.

Should the Railway Holding Company Be Outlawed?

Attention is here called to Prof. James C. Bonbright's discussion:

If the holding company were outlawed there would be left the following devices for affecting railway unification:

1. The lease.
2. The merger.
3. The purchase of the controlling stock of one operating company by another operating company.

The effectiveness of the third device might be greatly lessened by outlawing the so-called pure holding company. By pure holding company is meant a corporation which merely owns the securities of other corporations without operating any business.

While the consolidation provision of the transportation act looked ultimately to outright fusion as the permanent form of combination, the existence of paragraph (2) of section 5 indicates that the Congress contemplated a looser form of unification as an intermediary step. Since it is more than likely that when once the railways of this country are completely merged into final consolidations they will remain merged, it appears desirable that the Congress for some time should continue the provision for the looser form of combination offered by the holding company.

There are three reasons for believing that under certain conditions the pure holding company is preferable to the operating company as a basis of railway consolidation:

First the advantage of a more symmetrical type of managerial organization.

Second, the advantage of a more effective financial plan.

Third, the adaptability of the holding company for the control of constituent companies within the system, subsidiary to or affiliated with the operation of railroads.

The most important of these advantages appears to be the second. It seems inadvisable to burden an operating company with issues of securities, the purpose of which would not be to finance its own property but simply to obtain control of other properties in different parts of the country. Through the holding company the burden of the quasi fixed charge may be spread more evenly over the entire system instead of being concentrated in one operating company. Then, too, if the holding company fails, the credit of the constituent members of the system would not be so adversely affected.

An abstract of the report follows:

Analyses of Statistical and Other Data

The investigation authorized by House Resolution 114 is commonly referred to as a holding company investigation and such it primarily is. However, the holding company is only one and a rather special agency through which control may be exercised.

Control is not easy to define or to measure. In the case of some railroads whose stock is widely held and whose affairs, year in and year out, are reasonably well conducted, there may be no group of stockholders to whom even a semblance of control can be attributed. In other cases the management must be alert and ever mindful of the potential encroachments of outsiders, knowing that continuance in power requires that any large adverse holdings of the company's stock be matched and that friendly relations be maintained with minority groups. In still other cases, a dominant personality among the stockholders may exercise a control to which his holdings do not entitle him; or communities of interest in other fields may hold diversified holdings together in a loose confederation while conditions are normal, and drive them into compact groups when emergencies arise. Control is, then, a variable condition, being sometimes assured where it does not seem to exist in fact, and in other instances threatened even though it rests on large holdings.

Friendly or business understandings, communities and alliances of interests, the influence of personalities, and other such intangible factors can not be brought into a statistical analysis of railroad control. H. Res. 114 clearly did not contemplate an investigation of the scope necessary for the determination of control in this broad sense. The present phase of the in-

quiry is therefore directed primarily at ascertaining the facts as to the ownership of the voting securities of individual railroads as a means of determining the extent to which the various agencies named in the resolution participate in such ownership, the processes by which such securities are acquired, the agencies through which they are held, and the effects of such ownership on the control and the regulation of railroads.

Two approaches at once suggest themselves in ascertaining the facts as to the ownership of railroad securities. One is that of going direct to the agencies who are known or presumed to hold railroad securities and to ascertain, by actual audit, the amounts of stock each such agency owns or has an interest in and to determine the nature of the activities of such agency. The second approach seems simpler and more satisfactory for the purposes of a general survey. It is to go to the stock registry books of the railroads and to ascertain from them the ownership of the outstanding securities. One difficulty is the fact that the names known to the railroads and recorded on their books are so generally not the names of the true parties in interest but those of brokers, nominees, and other intermediaries.

The railroads have, however, many essential facts in their possession and their stockholders' lists serve at least as points of departure. The committee therefore addressed its first inquiry in the form of a questionnaire to Class I railroads. This required, first, a statement of the amount, authorized and actually outstanding, of any securities to which actual or contingent voting rights attach, with a full statement of any qualifications or contingencies as to voting. The respondent railroad was required to state whether it is controlled by any individual, corporation, association of individuals or corporations, or other agency, or jointly controlled. If so, it was required to set forth by whom, in what manner, and through what intermediate agencies, if any, and to what extent it is controlled. This line of inquiry was immediately followed with schedules in which were to be set forth the names and office address of the 30 largest holders of each class of voting security and the number of votes to which each is entitled. All of this was to be shown as of December 31, 1929, and as of the latest date possible, usually the record date for dividends declared for the first quarter of 1930.

To obtain further indications of where and how control is held, the affiliations of each of the directors and general officers of the respondent with other railroads, with banks and other financial institutions, with insurance, industrial, and public-utility companies, and, in fact, with business enterprises of any description, were required to be set forth.

A question may arise as to how far a list of merely the 30 largest stockholders of each class advances the investigation. The answer varies considerably with the property, as is pointed out in each of the individual analyses which follow. A condensed summary of the percentage of total voting power found in the names reported to the committee by the railroads, follows:

Per cent:	Number of cases
0 to 9.99	1
10.00 to 19.99	6
20.00 to 29.99	7
30.00 to 39.99	3
40.00 to 49.99	11
50.00 to 59.99	6
60.00 to 69.99	7
70.00 to 79.99	13
80.00 to 89.99	7
90.00 to 99.00	15
99.00 to 100.00	68
Total	144

The lowest percentage, 1.56, is that of the Pennsylvania Railroad; for such roads as the Baltimore & Ohio, Santa Fe, New York Central, Illinois Central, etc., the percentage ranges from 13 to 39; for many large properties it runs 75 per cent or higher. On the other hand, the total number of stockholders is very great. Thus the Pennsylvania Railroad had 196,119 on December 31, 1929, and 206,407 on May 1, 1930; the Santa Fe had 59,042 on the earlier date; such smaller properties as the Norfolk & Western and the Delaware & Hudson had 12,068 and 9,003 stockholders, respectively. In fact, Class I railroads, as a whole, have approximately 840,000 stockholders. Obviously, an analysis of so extended a list of names would be out of the question. Moreover, such an investigation is not necessary, for beyond a certain point the individual holdings become so small and the owners represented so remote from the conduct of the property that the actual ownership loses significance.

To get back of the names reported by the railroads where these do not represent the true owners of the stock, three additional questionnaires were sent out: No. 3, addressed to 275 brokers and certain investment bankers, banks, and trust companies; No. 4, addressed to 80 investment and holding companies; and No. 5, addressed to 175 persons or firms known or thought to be acting as nominees. Each was required to report not only the stock listed to it by the railroad, but all other holdings of railroad stock, whether held as broker, nominee, or pledgee. In the case of some roads, such supplementary information assumed extensive proportions. For example 485,349 shares of New York Central stock were found in some 210 additional returns. Thus a substantially complete coverage of the holdings of the principal brokerage and investment banking houses was effected and the lists of nominee and investment company holdings considerably expanded.

Respondents were asked to report in each instance who had the beneficial interests in the stocks thus listed. This line of inquiry runs out into many devious channels. Without committing itself to the view that it lacked the power to require the furnishing of full information about individual holdings, the committee took the position that it would not require the divulgence of information which would not materially advance the investigation. It, therefore, permitted the broker to designate any customer by number who holds in excess of 500 shares of the stock of any railroad and who would affirm that the stock in which he has a beneficial interest is held by him solely for investment or speculative purposes and in no way for the purpose of influencing or controlling management, individually or in concert with others. The customers were not, of course, necessarily individuals; doubtless a considerable variety of other interests is represented by the numbers. Stock carried on margin was kept distinct from that which was fully paid for.

Holdings below 500 shares were designated "miscellaneous" and were permitted to be grouped.

Special studies or compilations based for the most part on official material on file with the Interstate Commerce Commission were made to supplement the information obtained by the questionnaires. Numerous special inquiries were also addressed to the respondents to clear up doubtful points.

Analysis reveals that railroad-capital structures are simple in character. Of 147 Class I railroads studied, 80 have only one class of stock, and 44 have only two classes of stock. In all but exceptional cases equal voting rights attach to all stock outstanding.

Holding Companies as a Factor in the Ownership and Control of Railroads

In the ensuing discussion attention is first directed to holding companies which have been set up by interests other than the railroads themselves and then to those which are members of the railroad family. In a restricted sense, the term "holding company" applies to companies whose sole business is that of serving as agencies or instrumentalities for acquiring and carrying securities for the beneficial interest of one or more other companies or groups. An example is the Railroad Securities Co. of the Union Pacific Railroad Co. In a great number of cases in the railroad field the companies through which a parent company derives an interest in other companies are now or have been engaged in conducting transportation or other operations. Thus the Union Pacific's 100 per cent interest in the Oregon-Washington Railroad & Navigation Co., a large Class I railroad, is through the Oregon Short Line Railroad Co., also an active railroad company, and its interest in the Los Angeles & Salt Lake Railroad Co. is one-half direct and one-half through the Oregon Short Line. Through the latter the Union Pacific also derives an interest in a number of other companies.

Van Sweringen Holdings

In a general report is set out the combined effect of the activities of the Van Sweringen companies during the periods investigated together with such outstanding transactions as have a distinct bearing on the purchase, holding, or sale of securities of common carriers. The individual reports deal more specifically with these companies. There is presented below a summary of the holdings of such of the Van Sweringen holding companies as are not subject to railroad control. All holdings are common stock unless otherwise indicated.

The interest in a vast number of other carrier and noncarrier companies which the controlling or substantial interests shown above carry with them is shown in tabular and graphic form in the summaries of the respective railroad companies named above.

The list of holding companies which exercise or participate in the control of railroads and which are not themselves members of the railroad family is not extensive, but it includes several companies which control or substantially control vast networks of railroad lines. A majority of the companies treated are of recent origin and owe their organization to a number of factors. Some, however, such as the Atlantic Coast Line Co., the Lehigh Coal & Navigation Co., and one or two of the smaller companies, are deeply rooted in the past, and the special considerations which contribute to the organization of holding companies to-day do not go far to explain their organization. Thus, the older companies issued no nonvoting stocks, the only

nonvoting capital at their disposal being that raised through the issuance of funded debt or other obligations.

Leaving for discussion elsewhere the Van Sweringen holding companies, it may be said that the remainder of the companies which have been organized in recent years owe their organizations to (1) an effort to secure control of properties with relatively smaller contributions of capital than would otherwise be necessary, as by means of successive issues of stock, much of it without voting power, and the issuance of bonds secured by

Van Sweringen Holdings

Name	Number of shares	Per cent of total voting power
Alleghany Corporation:		
New York, Chicago & St. Louis R. R. Co.	100,000	29.67
Chesapeake & Ohio Ry. Co.	32,925	2.22
Erie Railroad Co.	215,000	7.52
Missouri Pacific R. R. Co.—		
Common	482,100	....
Preferred	192,300	....
Total	1,022,325	66.11
Kansas City Southern Ry. Co.	106,100	20.82
Great Northern Ry. Co., preferred	11,500	.46
Atchison, Topeka & Santa Fe Ry. Co.	8,500	.23
Buffalo, Rochester & Pittsburgh Ry. Co.	1,120	.68
New York Central R. R. Co.	6,700	.13
Wheeling & Lake Erie R. R. Co.	54	.01
St. Joseph Belt Ry.	4,000	1.00
Geneva Corporation:		
New York, Chicago & St. Louis R. R. Co.	68,100	20.20
Erie R. R. Co., second preferred	10,900	0.38
Chesapeake Corporation:		
Chesapeake and Ohio Ry. Co.	814,600	54.81
Pere Marquette Ry. Co.	19,500	2.84

pledged stock; (2) a desire to secure freedom of action with respect to the issuance of securities and the acquisition of properties beyond the control of the provisions of the transportation act of 1920; (3) a desire to take advantage of the corporation laws of certain states; (4) a desire to make more convenient the holding of large personal fortunes or the interests represented by an estate; and (5) to considerations more commonly associated with holding companies in the public utility field. A considerable number of the companies which have been considered have issued nonvoting preferred stock, and in several instances a holding company is itself controlled by one or more holding companies.

The holding companies consist principally of the following: New York Transit & Terminal Co. (Ltd.) (Baltimore & Ohio); Securities Corporation of the New York Central Railroad; Boston Railroad Holding Co. (New Haven); Pennsylvania Co.; The Pennroad Corporation; Virginia Transportation Co. (Chesapeake & Ohio); Mississippi Valley Co. (Illinois Central); Mississippi Valley Corporation (Illinois Central); Railroad Securities Co. (Union Pacific).

In the majority of instances these companies, which, with the exception of The Pennroad Corporation, are owned in their entirety by a railroad company, have only one class of stock outstanding and generally no funded debt. Pennsylvania Co. has outstanding $20,000,000 of gold 4's and $50,000,000 of secured 4¼ bonds, and Railroad Securities Co. has outstanding 34,864.2 shares of no par common stock and 19,369 shares of no par preferred stock and an additional $8,000,000 of 4 per cent Illinois Central series A stock interest certificates. Boston Railroad Holding Co. has outstanding $3,106,500 of common stock and $27,190,900 of nonvoting preferred stock, a rather striking use of the nonvoting stock device whose effects are somewhat, though not entirely, mitigated by the fact that the New Haven owned all of the common stock and practically all of the preferred.

With these rather important exceptions, it may be concluded that the financial structures of holding companies of this type are simple and the purposes in using such companies are principally of those of segregating assets, escaping the full regulation of Interstate Commerce Commission accounting inspection and publicity, conforming to state laws, and possible use as temporary depositaries of stock, much as a suspense account, pending final disposition.

The holdings of railroad securities by companies other than active or inactive railroads and holding companies are generally limited in amount or confined to unimportant railroads. An exception is the Southern Pacific Land Co., which holds 24.79 per cent of the total voting power of the St. Louis Southwestern Railway Co. and 4.04 per cent of that of the St. Louis-San Francisco Railway Co. This company has only one issue of stock outstanding, all owned by the Southern Pacific Co.

By way of conclusion it may be suggested that the matters herein analyzed which merit further attention are: (1) The activities of holding companies whose purposes are to defeat the plan of regulation—control of unification of properties, control of capitalization, etc.—prescribed in the transportation act of 1920; (2) whether any railroads are engaged in activities too far afield from the business of transportation or in fields inconsistent with the common carrier functions of the railroads; (3) whether by means of separate corporations the accounting and publicity requirements of the interstate commerce act are being defeated; and (4) whether a simplification of corporate structures would not be in the public interest, particularly in those numerous instances where the subsidiaries appear to have outlived their usefulness.

The Ownership of American Railroads

There were on December 31, 1929, 160 Class I railroads in the United States. They operated 242,000 miles of road and had in 1929 operating revenues of $6,280,000,000. On their stock registry books stood some 840,000 names. Their gross capitalization approximated $23,000,000,000. At first glance, magnitude and breadth of operations appear to be their distinguishing characteristic.

Closer examination reveals, however, that the operating revenues of the roads which make up these totals range from less than $1,000,000 to over $680,000,000 per annum, a range which obviously is indicative of large differences in the amount of transportation services furnished the public by individual carriers. From the road with far-flung lines which the public regards as typical of railroads generally are to be differentiated companies whose lines have limited geographic reach—the short or local lines—the companies whose lines have a special or limited rather than general traffic opportunity—the lines identified with a single industry or producing area—and the companies whose lines serve mainly in a "bridge" or "terminal" or other ancillary capacity for the benefit of other railroad companies.

These illustrative distinctions as to functions serve to a considerable extent to explain the differences which exist in the ownership of railroad securities. Except where under the control of other like companies, railroads of the first or general type tend to be characterized by diffused ownership of securities, if for no other reason than the magnitude of their capital requirements; local roads tend to be locally owned; roads serving particular industries are usually owned by those industries; and roads serving other railroads by those railroads.

Observing these distinctions so far as the facts justify, a grouping of railroads according to the manner of control is offered below. Such grouping should go far to clarify an otherwise considerably confused situation. Each Class I railroad will be accounted for. Subsequently a few facts as to the ownership of Class II and III railroads and switching and terminal companies will also be presented.

The groupings here made are based on the information which has become available in the course of this inquiry and which is summarized in the analyses of individual railroads.

It will be observed that Group III comprises the greatest number of companies but represents less mileage than Group V, though the latter is made up of less than one-fifth as many

Table I—Classification of Class I Railroads According to Manner of Control

Group	Number of companies	Per cent of total	Road mileage operated	Per cent of total
I. Railroads owned or controlled by an industry	13	8.18	3,282.87	1.36
II. Railroads wholly or largely controlled by an individual family	18	11.32	21,137.52	8.76
III. Railroads owned or controlled by other railroads	88	55.35	80,182.78	33.21
IV. Railroads whose securities are held in large part by one or more interests	18	11.32	32,875.97	13.62
V. Railroads of which there is no marked concentration of ownership	16	10.06	97,569.25	40.41
VI. Miscellaneous—control held by investment syndicates, voting trustees, etc.	6	3.77	6,381.26	2.64
Total	159	100.00	241,429.65	100.00

companies. The first group, while comprised of 13 companies, has only 3,282.87 miles, indicating that industrially owned railroads average only 250 miles in operated mileage. Group II shows a larger mileage owing to the inclusion therein of the companies controlled by the Van Sweringen interests. Group VI is a small group and includes as its principal item the Seaboard Air Line. Systems have been taken apart in deriving the foregoing grouping. Group III obviously requires distribution to one or more of the other groups. In such distribution the subsidiaries of each company in Group III would take the same classification as the parent company. Thus, the Burlington,

controlled by the Great Northern and Northern Pacific, would go to Group V and take with it, for example, the Colorado & Southern and the latter's subsidiary, the Fort Worth & Denver City. The table below gives the results of such distribution.

No change occurs in Groups I and VI. Group V expands by one-half, and now comprises 146,465.28 miles, or 60.54 per cent of the total. Included in the 16 companies are 4 companies which have relatively small mileage, thus reducing the

Table II—Classification of Class I Railroads According to Manner of Control

Group	Number of companies	Per cent of total	Road mileage operated	Per cent of total
I. Railroads controlled by an industry	13	8.12	3,282.37	1.36
II. Railroads wholly or largely controlled by an individual or family	18	....	21,137.52	....
Railroads subsidiary to companies in Group II	13	....	8,689.76	....
Total	31	19.38	29,827.28	12.32
IV. Railroads whose securities are held in large part by one or more interests	18	....	32,875.97	....
Railroads subsidiary to companies in Group IV	14	....	14,225.72	....
Total	32	20.00	47,101.69	19.47
V. Railroads of which there is no marked concentration of ownership	16	....	97,569.25	....
Railroads subsidiary to companies in Group V	46	....	48,896.03	....
Total	62	38.75	146,465.28	60.54
VI. Miscellaneous—Control held by investment syndicates, voting trustees, etc.	6	3.75	6,381.26	2.64
VII. Unassigned—Railroads subsidiary to more than 1 group or to Canadian or Mexican railways.	16	10.00	8,876.87	3.67
Total	160	100.00	241,934.75	100.00

number of important properties in the group to 12. Group II expands somewhat, owing to the inclusion of the subsidiaries of the Van Sweringen properties, and Group IV also becomes larger. A group of companies which could not be assigned to one of the other of the groups is now set up as No. VII. Still further gathering together of these companies is possible if the companies in Group IV are identified with other companies on the basis of substantial holdings of stock. The following statement of relationships is suggested but without definite assignment. The assignment of the Illinois Central to the Union Pacific system would perhaps be justified by reason of the fact that the latter owns by far the largest block of Illinois Central stock, representing 28.94 per cent of the total.

Company	Company with substantial interest	Road mileage operated
Boston & Maine	Pennsylvania Railroad	2,077.22
Chicago & Eastern Illinois	Van Sweringen interests	946.24
Chicago Great Western	do	1,495.27
Chicago, Rock Island & Pacific	St. Louis-San Francisco	7,592.46
Delaware, Lackawanna & Western	New York Central Railroad	998.42
Kansas City Southern	Van Sweringen interests	784.01
New York, New Haven & Hartford	Pennsylvania Railroad	2,077.22
Norfolk & Western	do	2,240.10
Western Maryland	Baltimore & Ohio	877.67
Total		19,144.75

The above groupings increase the mileage attributable to the companies in Group V to 165,610.03, or to 68.60 per cent of the operated mileage of Class I railroads.

After the above distributions there remain in Group IV (Table II) only the following: Illinois Central, Maine Central, Bangor and Aroostook, Atlantic Coast Line Co., Denver & Salt Lake Railroad Co., St. Louis Southwestern Railway Co., and the following small or local lines: Pittsburg, Shawmut & Northern (in receivership), Mississippi Central, Green Bay & Western. The Atlantic Coast Line is a Walters property and the substantial interest of the Union Pacific in the Illinois Central has just been indicated. The principal interest in the St. Louis Southwestern Railway Co. is that of the New York Investors (Inc.), for which the Southern Pacific apparently has been negotiating. The Denver & Salt Lake Railway Co. is substantially controlled by the Denver & Rio Grande Western, but as the latter is controlled equally by the Missouri Pacific and the Arthur Curtiss James interests, allocation is difficult. The Maine Central is sometimes stated to be associated in interest with the Pennsylvania Railroad Co. Considerable speculative activity at the date of this inquiry in the stock of the Bangor & Aroostook is to be noted.

Roads Grouped Into 14 Major Systems

Making the allocations mentioned, except those suggested in the preceding paragraph, the following mileage of major Class I systems results, with indication of the ownership of the remaining Class I mileage:

	Road mileage operated
14 major systems:	
Van Sweringen companies	28,631.20
Great Northern-Northern Pacific	27,421.76
Pennsylvania	23,498.67
Southern Pacific	14,484.96
St. Louis-San Francisco	14,161.99
Atlantic Coast Line	13,989.10
Atchison, Topeka & Santa Fe	13,166.32
New York Central	13,006.07
Baltimore & Ohio	11,269.69
Chicago, Milwaukee, St. Paul & Pacific	11,247.83
Chicago & North Western	10,205.05
Union Pacific	10,157.11
Southern	10,036.55
Illinois Central	9,109.70
Total	210,386.00
Other Class I companies (independent):	
Seaboard Air Line	4,490.38
Arthur Curtiss James companies	3,845.69
Missouri-Kansas-Texas	3,188.57
Minneapolis & St. Louis (in receivership)	1,627.80
Maine Central	1,121.43
Gulf, Mobile & Northern	1,010.61
St. Louis Southwestern	1,002.12
Delaware & Hudson	881.42
Bangor & Aroostook	619.37
Green Bay & Western	232.34
Pittsburg, Shawmut & Northern (in receivership)	198.26
Mississippi Central	150.06
Joint between more than two railroads:	
Richmond, Fredericksburg & Potomac	117.59
Lehigh & Hudson River	96.60
Subsidiaries of Canadian or Mexican railways, 9 in number	7,120.91
Industrially owned railroads, 13 in number	3,282.87
Railroads wholly or largely owned by an individual or family, 12 in number	3,750.92
Railroads controlled by voting trustees, etc., 5 in number	1,890.88

In addition to the foregoing, considerable Class II and III mileage is operated by companies within the systems above. (Figures include some mileage in which there is only a part interest, usually one-half).

It is clear that the problem of determining the ownership and control of our railroads becomes mainly one of ascertaining the interests in control of the 14 large systems which comprise nearly 85 per cent of the rail mileage of the country. Attention is here directed to the manner in which the securities of the major companies are held. As a first step in this direction there is given below a general distribution of the ownership of securities of all Class I railroads embraced in this analysis.

Of the 14 major systems listed above one is headed by the Van Sweringen interests, one by the Walters interests, and

Table IV—Distribution of Ownership of Voting Securities of Class I Railroads Accounted for in Final Analyses[1]

	Common stock		Preferred stock and other voting securities		All voting securities	
Classification	Votes	Per cent of total	Votes	Per cent of total	Votes	Per cent of total
Individuals and estates	11,550,739	16.11	2,773,111	13.74	14,323,850	15.59
Railroads and railroad holding companies	16,462,687	22.96	3,698,365	18.33	20,161,052	21.94
Insurance companies	413,459	.58	494,876	2.45	908,335	.99
Investment trusts, investment companies, etc.	2,532,991	3.53	1,068,182	5.29	3,601,173	3.92
Educational and charitable institutions, etc.	220,017	.31	122,273	.61	342,290	.37
Brokers, for themselves or an unknown number of accounts	251,955	.35	161,423	.80	413,378	.45
Others	950,780	1.33	242,778	1.20	1,193,558	1.30
Total	32,382,628	45.17	8,561,008	42.42	40,943,636	44.56

[1] Except in a few cases, the information given is as of Dec. 31, 1929.

in one another railroad has a very substantial interest. Twelve companies are left (counting the Great Northern and Northern Pacific as two), to which may be added the Missouri-Kansas-Texas from the group of other companies. A few pertinent facts as to the companies which head each of these systems are presented below.

It is clear from this table how very broadly held are the securities of these 13 companies. The total number of stockholders, including duplications, ranges from 12,693 in the case of the smallest of the companies to 196,119 in the case of the Pennsylvania Railroad. The per cent of total voting power held by the 30 largest holders of record ranges from only 4.56 per cent in the case of the Pennsylvania to 30.12 in the case of the Missouri-Kansas-Texas.* Even these percentages give a picture of concentration which does not really exist, for literally hundreds and in some cases thousands of individual accounts are represented by names, especially those of brokers and banks, included among the 30 largest holders as shown on the railroads' books. The largest interest which has been identified holds in excess of 5 per cent of the total voting power in only one case and generally the largest such holding is less than 3 per cent. In only six cases are there 10 or more holdings of 10,000 shares or more each.

Table V—Character of Ownership of Voting Securities of 13 Large Class I Railroads

Company	Total number of stockholders	Per cent of stock held by 30 largest holders on record	Per cent of total voting power held by thirtieth largest holder	First and second largest interests (per cent of total voting power)	Number of holdings of 10,000 shares or more
Atchison, Topeka & Santa Fe Ry. Co.:					
Common	40,927	11.14	0.12	0.76 and 0.74	12
Preferred	18,115	16.75	.08	.....	..
Total	59,042	13.04	....	.....	..
Baltimore & Ohio R. R. Co.:					
Common	34,783	16.23	.22	2.56 and 0.72	9
Preferred	11,788	16.11	.04	.....	..
Total	46,571	16.20	....	.....	..
Chicago & North Western R.R. Co.:					
Common	14,448	19.18	.23	3.45 and 2.45	7
Preferred	2,335	33.62	.06	.....	..
Total	16,785	20.97	....	.....	..
Chicago, Milwaukee, St. Paul & Pacific R. R. Co.:					
Common	.....	48.57	.13	1.36 and 1.29	8
Preferred	.....	47.17	.23	.....	..
Total	.....	47.86	....	.....	..
Great Northern Ry. Co., preferred	42,085	12.98	.23	2.12 and 0.94	8
Missouri-Kansas-Texas R. R. Co.:					
Common	2,768	37.32	.42	4.09 and 2.23	[1]9
Preferred	9,925	21.18	.16	.....	..
Total	12,693	30.12	....	.....	..
New York Central R. R. Co.	52,690	22.57	.03	5.35 and 4.78	12
Northern Pacific Ry. Co.	38,339	14.63	.24	2.13 and 1.20	8
Pennsylvania R. R. Co.	196,119	4.56	.09	0.34 and 0.26	18
St. Louis-San Francisco Ry. Co.:					
Common	8,931	25.59	.22	4.01 and 3.98	[1]8
Preferred	6,934	27.91	.17	.....	..
Total	15,865	26.59	....	.....	..
Southern Pacific Co.	55,788	15.10	.17	1.65 and 1.37	15
Southern Ry. Co.:					
Common	13,139	27.11	.23	4.56 and 1.83	10
Preferred	7,123	22.69	.12	.....	..
Total	20,262	25.71	....	.....	..
Union Pacific R. R. Co.:					
Common	37,876	14.01	.16	2.27 and 1.85	11
Preferred	11,511	23.61	.08	.....	..
Total	49,387	16.98	....	.....	..

[1] Number of holdings of 5,000 shares or more.

The foregoing more than suffices to establish the necessity in these cases of looking elsewhere than to the stockholders' lists for information as to where control finally rests. Some assistance can be had from the lists of the boards of directors. It may have to be concluded, however, that the inertia of large numbers often enables persons with a relatively small financial stake in a property, whether such persons are acting for themselves or are associated with investment and commercial banking houses or with industries who look to the railroads as an important market, to play a controlling part in railroad affairs. The explanation may be merely that such persons actively interest themselves in the affairs of a particular railroad, that tradition or long usage supports a relation between a railroad and a banking group, or, perhaps more fundamentally, that railroads, the same as any other industry, must look constantly to the source of capital funds and must bargain with those who have the dispensation of such funds in their control. Similarly, skillful operators of railroad properties, and perhaps some less skillful, may be able to maintain themselves in power over a period of years without substantial support from any outside group.

Approximately 22 per cent of the total voting power of these companies is accounted for, of which 15.55 per cent is attributable to individual and estates, 1.14 per cent to other railroads and railroad holding companies, 1.13 per cent to insurance companies, 1.80 per cent to investment trusts, investment companies, etc., 0.54 per cent to educational and charitable institutions, and 1.80 per cent to miscellaneous parties, generally brokers and investment bankers for their own accounts, or, where information was lacking, for their customers. The larger the company the smaller the percentage of total voting power accounted for.

Some 59 insurance companies were found among the holders of the stock of Class I railroads having operating revenues of more than $25,000,000 per annum. Of these, 29 hold stock of 1 railroad, 9 of 2, 14 of from 3 to 6, 4 of from 8 to 10, and 3 of 14. These figures are confined, of course, to the securities which have been covered in the analyses. Considerable railroad stock is doubtless held in amounts below the minimum for which detailed information was asked and in accounts which do not come within the survey.

Some 136 investment trusts and investment companies were found upon analysis to be holders of railroad securities.

Relationships of Railroads with Other Forms of Business Enterprise

Attention is here directed to the relationships which exist between railroads on the one hand and industrial and financial institutions on the other. With possibly two exceptions, the analyses reveal only a few and very unimportant direct investments of industries in railroad securities.

At one time it was customary to speak of certain roads as Morgan, Hill, Harriman, Gould, or other properties. In considerable part such designations rested on personal ownership, at least in the case of such of these men as identified themselves solely with transportation enterprises. The tradition that certain men "own" our railroads continues down to date, despite the fact that even in the early days personal ownership required supplementation from other sources to be effective and despite the fact that, barring a few exceptional cases, a vast diffusion of ownership has occurred in the course of the past two or three decades. The emphasis has perhaps shifted a little at this time, the thought now being that the financial houses headed by the great names in modern finance own vast amounts of railroad securities. Taken literally and even somewhat broadly, such a view does not accord with the ascertainable facts.

The table [omitted] shows that on December 31, 1929, five large banks and trust companies and nine investment banking or brokerage houses held in their possession $415,816,876 par value of the stock of Class I railroads, or 5.08 per cent of the total outstanding voting securities of all such railroads. The largest bank holding shown is that of the United States Trust Co. of New York and the largest holding of an investment banking house is that of J. P. Morgan & Co. These represent 0.74 and 1.38 per cent, respectively, of the total voting securities of all Class I railroads, and, as will be indicated presently, do not indicate ownership.

The second table shows the number of railroads whose securities are held by each company listed and the principal holdings. In only six cases do the amounts shown represent more than 5 per cent of the total voting power of the roads named. The bank holdings are all less than 5 per cent and generally less than 2 per cent. The size of the holdings of Kuhn, Loeb & Co. in New York, New Haven & Hartford stock, of Morgan & Co. in Missouri Pacific and Chesapeake & Ohio, and of Paine, Webber & Co. in Missouri Pacific, Chicago Great Western, and Erie is indicative of buying activities in which the firms named are acting in the capacity of agent and not as principal. Other brokers and nominees serve as agents of these agents, as is pointed out presently. Holding of stock for themselves is limited among the firms named.

The foregoing is not intended to supply an answer to the question of banker-railroad relationships.

Far fewer railroad directorships are held by members of the above firms than would be expected. This line of evidence therefore requires supplementation in the same manner as that relating to the railroad securities owned or controlled by such firms. The holdings by banks and trust companies are also to only a minor extent for the beneficial in-

* The Milwaukee percentage is higher but special permissions are present in this case.

terest of the banks themselves. Some of the stock carried by such institutions for individuals, estates, charitable, educational, and other institutions is in the banks' own names but frequently is in the names of nominee firms engaged solely in acting in such capacity for a single bank.

In investigations of control it has generally been the custom to lean rather heavily on interlocking directorates as a line of evidence. The present study prompts the view that such evidence can easily be overworked unless it is very exhaustively examined. Though the make-up of a railroad's board of directors furnishes much information that is essential to an understanding of the control of that railroad, in many respects the clues thus furnished are either misleading or confusing.

A comprehensive analysis for every railroad of the interests which each director represents and of the significance of the presence of representatives of such interests on the board would therefore be not only a very involved process but one which would be practically impossible of satisfactory achievement in the absence of intimate knowledge of the affairs of each company. Such knowledge no one possesses for all railroads, though many may possess it as to the particular railroads in which they have a more than passing interest or acquaintance.

With the foregoing statements in mind, attention may be directed to a few facts bearing on the relationships between railroads generally and banking and insurance companies.

The directors or general officers of all Class I railroads are directors of 132 larger banks and trust companies (567 before elimination of duplications caused by the same bank

Table X—Class I Railroads Whose Voting Securities are Held by Large Banks, Investment Bankers and Brokers[1]

	Number of Class I roads whose voting securities are held	Large holdings: Road	Large holdings: Per cent of outstanding voting capitalization of road
Banks and trust companies:			
Bank of New York & Trust Co.	70	New York Central	0.79
		Northern Pacific	.34
Chatham-Phenix National Bank & Trust Co.	32		
Girard Trust Co., Cleveland	13	Chesapeake & Ohio	.28
U. S. Trust Co. of New York	47	Chicago & North Western	3.81
		Delaware, Lackawanna & Western	3.08
Do	..	Great Northern	1.18
Do	..	New York Central	1.21
Do	..	Northern Pacific	1.64
Do	..	Southern Pacific	1.43
Do	..	Southern Ry.	2.04
Do	..	Union Pacific	1.84
Investment bankers and brokers:			
Kidder, Peabody & Co.	6	New York, New Haven & Hartford	1.26
Kuhn, Loeb & Co.	40	Do	9.70
Lee, Higginson & Co.	41	Pennsylvania	.18
J. P. Morgan & Co.	43	Great Northern	3.43
Do	..	Missouri Pacific	37.38
Do	..	Chesapeake & Ohio	11.52
Do	..	Northern Pacific	3.36
Brown Bros. & Co.	47	New York Central	.28
Hayden, Stone & Co.	17	Erie	[2] 2.65
A. Iselin & Co.	18	New York Central	.48
Do	..	Southern	1.08
Otis & Co.	50	Chicago Great Western	1.14
Do	..	Chicago Milwaukee St. Paul & Pacific	.65
Paine Webber & Co.	48	Chicago Great Western	21.46
Do	..	Missouri Pacific	7.43
Do	..	Erie	5.66

[1] The largest holding for each concern is included in each case and other large holdings are given.
[2] Bonds carrying voting rights are included.

being reported in more than one railroad return), a figure which may be compared with the total of approximately 25,000 banks of all descriptions in the United States. Of the 132 banks, 60 have resources of $100,000,000 or more, 34, resources of $50,000,000 to $100,000,000, and 38, resources of between $25,000,000 and $50,000,000. These banks are situated mainly as follows: 36 in New York City, 12 in Philadelphia, 10 in Chicago, 8 in Pittsburgh, 7 in Boston, 6 in San Francisco, 5 in Baltimore, 4 in Minneapolis-St. Paul, 4 in Detroit, 4 in Cleveland, and 3 in St. Louis.

Some 791 directors are represented in the total shown above. However, as an individual director may serve on the boards of more than one bank, the net number of directors or officers of railroads who are also directors of banks is 533. In most cases there is only 1 director in common with the bank. In 98 cases there are 2, in 23 cases 3, in 10 cases 4, in 7 cases 5, and in 3 cases 6 to 10.

The only satisfactory way of securing information as to the investments which directors have in the securities of the companies whose affairs they are expected to manage would be a special query addressed to each such director. The method of analysis pursued in this investigation doubtless leaves unrevealed a great many holdings of securities by directors. However, assuming that directors hold such stock as they own in their own names, it may be safely said that such holdings as could not be found would not exceed a very low minimum figure. With these facts in mind, attention is directed to the table below which indicates what proportion of the directors of the 23 companies included

Table XII—Directors' Holdings of Railroad Stocks

		Holdings which have been identified	
Railroad	Number of directors	Name of director	Per cent of total voting power
Atlantic Coast Line	13	Walters, Henry	[1] 5.64
		Newcomer, Waldo	[1] 3.80
		Jenkins, G. C.	[1] 2.35
Atchison, Topeka & Santa Fe	14	Taylor, M. C.	.28
Baltimore & Ohio	13	Widener, J. E.	.70
		Baruch, B. N.	.18
Chicago & North Western	17	Vanderbilt, F. H. } Vanderbilt, H. S. }	3.45
		Field, Marshall	1.34
Chicago, Milwaukee, St. Paul & Pacific	15	Harkness, E. S.	1.29
Chicago, Rock Island & Pacific	15	Brown, E. N.	.40
Delaware & Hudson	13		
Delaware, Lackawanna & Western	14	Baker, G. F., Jr.	10.27
		Fahnestock, Wm.	1.89
		Moore, Paul	1.01
		Talmadge, J. F.	.72
		Winthrop, Beekman	.42
Great Northern	12	James, A. C.	2.12
		Hill, L. W.	.47
Illinois Central	12	Goelet, R. W.	.77
		Astor, V.	.32
Lehigh Valley	12	Moore, E. S.	.78
Missouri-Kansas-Texas	15		
New York Central	15	Vanderbilt, H. S. } Vanderbilt, F. W. }	4.78
		Baker, G. F.	4.09
		Harkness, E. S.	1.34
New York, Chicago & St. Louis	13	Van Sweringen, M. J.	16.91
New York, New Haven & Hartford	20	Richards, J. L.	1.29
		Charlton, E. P.	.97
		Pratt, G. P. } Pratt, H. I. }	.76
Northern Pacific	11	Sloane, J.	.40
Pennsylvania	17		
Reading	9	Widener, J. E.	4.21
St. Louis-San Francisco	17		
Seaboard Air Line	28		
Southern	12	Milbank, J.	[2] 1.92
Southern Pacific	15	Dodge, Cleveland	1.66
		Harkness, E. S.	1.28
		Douglas, W.	.75
Union Pacific	14	Harriman, E. R. } Harriman, W. A. }	1.85
		Goelet, R. W.	.65

[1] Also an interest, especially large in the case of Henry Walters, through Atlantic Coast Line Co.
[2] Plus indirect holdings.

have holdings which have been identified and the extent of such holdings. Included are holdings of relative and of wholly-owned investment companies. Directors having nominal holdings for qualifying purposes are not included.

The table shows that of the 336 directors included, 40, or 11.90 per cent, hold securities of the railroads of which they are directors. In 15 cases the holdings represent less than 1 per cent of the total voting power of the companies and in 10 cases between 1 and 2 per cent. The only cases of large holdings are the Van Sweringen holding in the New York, Chicago & St. Louis, the Baker holdings in the Delaware, Lackawanna & Western and the New York Central, the Vanderbilt holdings in the New York Central and the Chicago & North Western, the Walters and related holdings in the Atlantic Coast Line, the Widener holdings in the Reading, and the Arthur Curtiss James holdings in the Great Northern. In a few instances the percentages should be increased. The table is limited to the largest companies. There are instances in which companies of considerable size have on their boards men who have substantial holdings of their securities.

The question of whether individuals are serving on rail-

road boards beyond their capacity to take a real part in the affairs of the companies breaks into two parts. The first, which would require information about the personal qualifications of individuals placed on railroad boards, again illustrates the impossibility of drawing any worth-while conclusions without an intimate knowledge of specific situations. In its other phase the question permits of some statistical measurement. For this purpose a summary has been made of the number of different positions which the individual directors of some 15 large railroads hold. There are in the aggregate 219 directors and they hold some 2,298 positions, not including directorships of subsidiary companies. The average number of positions held is therefore approximately 10. However, the range is from 1 to 64 positions, making it necessary to state the matter in somewhat different terms. Approximately one-third of the directors hold one to five directorships, that three-fifths of them hold from one to ten positions and that two-fifths hold from 11 positions up. The cases which stand out in this connection are those of Charles Hayden, holder of 64 directorships, A. J. County and E. J. Berwin, 47 positions each, and W. A. Harriman, 44 positions.

Investment Trusts as an Agency of Railroad Control

The facts developed indicate clearly that the great majority of investment trusts are relatively small institutions and that even the larger ones, through practicing the necessary diversification, do not hold any appreciable amount of stock of any one railroad company. The whole tenor of the investment practices of investment trusts is to diversify and to refrain from acquiring a sufficient interest in any one company to involve responsibility for the management or well-being of such company.

It is necessary to determine, however, whether investment trusts in their interrelations do or do not prove to be factors in railroad control. Examinations of the relationships between investment trusts establishes no groups of holdings such as would result in concentrated interests of a magnitude which would be significant from a control standpoint.

It is therefore concluded that at this time the investment trust as such is not a factor in railroad control.

Investments of the Van Sweringen brothers in capital stock and bonds as of April 30, 1930, were said to amount to $523,012,715.

Under the head of family holdings the report gives statements of the holdings and percentage of voting power in various railroads by George F. Baker and George F. Baker, Jr., the Fahnestock family, Edward S. Harkness, the Harriman family, Arthur Curtiss James, the Vanderbilt family, the Whitney family and the Widener family.

In that part of the report relating to Van Sweringen activities it was stated that the Vaness Company had paid Bird M. Robinson, president of the American Short Line Railroad Association, at the rate of $100,000 a year during 1929 and part of 1930 which had been explained to the examiner as representing compensation and reimbursement for assembling and furnishing information relating to the economic condition and valuation of certain short line railroads with relation to consolidation. The report includes a statement by Mr. Robinson that the employment on individual account had been duly authorized by unanimous vote of the executive board of the association on October 15, 1928, upon the understanding that it would not be accepted until a plan solving the short line problem had been worked out and that it was not accepted until this was done. The employment, according to the statement, covered services and advice in the collection of data and the investigation of the general railroad problem; the making of studies as affecting the general problems of railway consolidation and the relation between railroads, including short and weak lines, with particular reference to the Chesapeake & Ohio, the Hocking Valley, the Pere Marquette, the Erie and the Nickel Plate, including information for the application of the Chesapeake & Ohio filed with the Interstate Commerce Commission on February 18, 1929. It was stated that this was considered as plainly consistent with the interests and policy of short line railroads. The C. & O. application included a plan for the treatment of the short lines, offering to acquire the control of each and every short line railroad which the commission considered ought to be continued in operation and included in the proposed grouping.

Discussion of the Report

In his discussion of the report in the House Mr. Parker said:

"You will be impressed, as you turn these pages, by the activity in the acquisition of control of railway properties in certain parts of the country. Let me emphasize that this activity is explained by the competition of great interests for the possession of strategic railway properties. Again, as you read the study of the constitutional power of Congress to regulate stock ownership in railroads engaged in interstate commerce, you will be impressed by the large powers the Congress possesses under the Constitution. It seems clear to me that the Congress can do about what it finds to be necessary to protect the public interest. Whatever the abuses of the holding company which this inquiry under House resolution 114 may bring to light, it seems clear that you have the power to correct the abuses, to remedy the evils, to subject the holding company to reasonable regulation without being reduced to the necessity of destroying it. That is, through proper regulation, so far as your powers are concerned, you can preserve the benefits of the holding company and at the same time remedy such evils as may call for correction.

The activities which may be construed to impose a burden upon interstate commerce, which may interfere with congressional planning in the public interest, have been by companies acting beyond the jurisdiction of the commission or at least as far without the reach of that jurisdiction as the cunning of lawyers could contrive. If these companies had unquestionably been subject to the commission's jurisdiction, I believe there would have been less complaint of their activities and less ground for accusation that they have engaged in grab as grab can contests. It is true that most of these acquisitions of control through the device of the holding company about which the commission has complained, will, it is announced, soon be submitted to the commission in connection with applications for four dominant systems in eastern territory. The outcome of the hearings will perhaps determine the attitude of the Congress with reference to the problem of what to do about such acquisitions during the past 10 years as the commission has brought to our attention. Similar acquisitions in the future, it appears, can readily be brought within the jurisdiction of the commission by amending paragraph (2) of section 5 of the interstate commerce act, as amended.

I favor such an amendment and believe that it should be passed with promptness. If all these matters are in good faith submitted to the commission in connection with those applications, I think it safe to leave the matters for the commission to adjudicate after they have heard the pleas and arguments of the parties at interest. But if there should be undue delay in coming to the commission with the proposed applications of the four systems, if there should continue to be striving after selfish advantage and hesitancy in submitting the issues to the commission, then the Congress may find it necessary to clothe the commission with undoubted power to compel divestiture of the ownership of railway stock where the commission would find that such ownership had been acquired without the commission's approval and was being continued contrary to the commission's finding of what is in the public interest.

REPORTABLE CASUALTIES to employees on the Pacific Lines of the Southern Pacific in 1930 were reduced 23.7 per cent as compared with the previous year. The average was 7.62 per million man-hours; while in 1929 it was 9.98 per million man-hours.

THREE MEN WERE KILLED and 12 were injured when a Denver & Rio Grande Western passenger train and a truck loaded with dynamite caps collided at a highway crossing in Salt Lake City, Utah, on February 3. The force of the explosion damaged the side of the locomotive and tore off the cab.

Hydraulic Crossing Gate

AN electrically-controlled hydraulic crossing gate has been developed by the Automatic Safety Signal Gate Company, Louisville, Ky., which is said to be the only automatic hydraulic crossing gate on the market, and possesses some unique features. In common with other forms of highway crossing protection this gate can be controlled either automatically, manually, or by a suitable combination of both methods. Where automatic operation is desired, the control can be effected through track circuits, rail or trolley contactors, or other devices, depending upon the particular conditions involved.

Each gate arm is operated by a piston acting in a cylinder to which the hydraulic fluid is transmitted from a hydraulic pump in a central master control unit. As many as four gate arms can thus be operated by one such unit. The pump operates only when lowering the gates, and an electric holding valve holds the gates in the lowered position while its solenoid is energized. When this solenoid is de-energized the gates are automatically restored to the clear position by gravity. The standard time interval required for lowering the gates is 15 sec., but any interval from 3 to 32 sec. may be provided, if desired. The hydraulic fluid is a pale semaphore oil which does not congeal at temperatures as low as 45 deg. F. below zero. It is claimed that a single supply of this oil last indefinitely.

The master control unit comprises the following equipment, housed in a separate cast iron case: The hydraulic pump, an electric motor to drive the hydraulic pump, a reservoir for the hydraulic fluid, an electric holding valve, a control relay, power-line lightning arresters and miscellaneous control equipment. While the electrical equipment can be furnished for almost any power supply, the usual plan is to use 10-volt direct current for the control relay and 110- to 220-volt alternating current for the holding valve and ⅓-hp. motor, as well as for the bell and flashing lights.

The gate arm is hinged vertically on a head which is free to rotate horizontally through an angle of 90 deg. in either or both directions, as desired. This feature makes it possible for a trapped vehicle to push its way through the closed gates without injury to either the gates or the vehicle. The hydraulic pressure applied to the gate piston is automatically regulated to eliminate any possibility of damaging an automobile which may be caught under a descending gate. An air chamber acts as a buffer further to insure smooth and even operation of the gate arm.

A set of four of these gates, recently installed on a double-track section of the Louisville & Nashville, is automatically controlled through the agency of track circuits and directional rail contactors. Full protection is provided for the operation of trains in both directions on either track, as well as for certain irregular switching moves.

An Installation of Automatic Hydraulic Crossing Gates on the Louisville & Nashville

Hygiene Lectures for Pennsylvania Employees

THE Pennsylvania, within the month of November, 1930, carried out an elaborate program of health lectures, given by the company's medical examiners for the benefit of employees, throughout the system, 34 cities in all being shown on the preliminary schedule.

A typical meeting was that at Altoona, Pa., on the evening of November 14, at which the attendance was about 500, half of whom were women. The lecture was open to the public and the audience included some others besides employees. The meeting was conducted by Dr. S. W. Hurst, medical examiner on the Middle division, who in his opening address spoke in a general way of the importance of physical fitness and of early diagnosis as a preventive of disease. Other physicians taking part were Doctors W. P. Rickert, J. M. Cameron, Fred Miller, and Frank Patterson. The subjects discussed were (1) eye, ear, nose and throat; (2) lungs and kidneys, with special reference to tuberculosis, rheumatism and nephritis; (3) diet; (4) stomach and intestines.

John Fair, Jr., acting safety agent at the railroad company's Altoona Works, gave a ten-minute address. Dr. Hurst, in closing the formal address, called attention to the importance of seeing a physician at least once a year; and he suggested that one's birthday is a suitable time to attend to this duty

The Altoona Works choir entertained the company with a delightful program of song.

The program for the meetings throughout the Pennsylvania System was prepared by Dr. Harvey Bartle, chief medical examiner of the Voluntary Relief Department. Special attention is given to the preparation of lectures in every day language and opportunity is given at the end of each meeting for free questioning and discussion on subjects pertinent to the program.

Dr. Hurst says that among the retired employees of the Pennsylvania now on the pension roll, there are over 300 persons over 80 years of age, and these individuals are all being interviewed with a view to gaining useful information as to the elements of life and conduct which contribute to longevity.

ONE HUNDRED AND FORTY-SEVEN MILLION passengers have, during the past 13 years, traveled on the Chicago, Milwaukee, St. Paul & Pacific, their journeys aggregating 12 billion miles; and the Safety department of the road reports that only one of these passengers suffered fatal injury in a train accident.

Motor Transport Section

Burlington Substitutes Motor Coaches for Trains

Highway operation enables savings of nearly $10,000 a month in train operating expenses

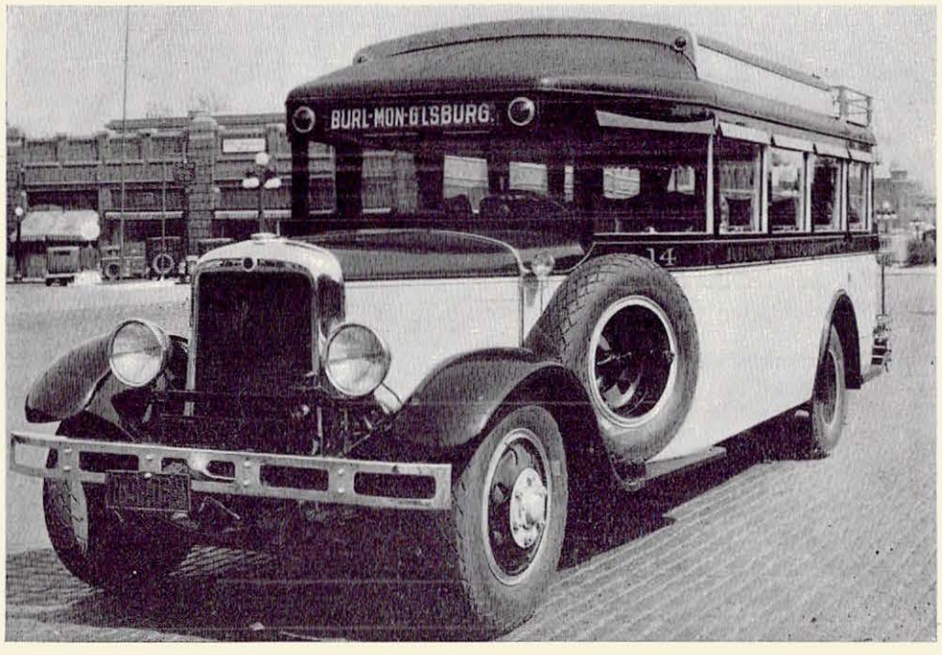
ON April 9, 1929, the Chicago, Burlington & Quincy embarked upon a program of motor coach substitution for local passenger trains. On that day it placed in service five motor coaches covering one route between Lincoln, Neb., and Omaha, and two routes between Lincoln and Hastings. In less than two years, a motor coach system covering 1,024 miles of routes has been developed. Thirty-eight motor coaches are in service, and the property investment of the Burlington, in its highway operations has been increased to $392,442.

In 1930 the transportation company operated a total of 1,940,971 motor coach miles, carried 260,778 passengers, and had passenger revenues of $305,005. At the present time its schedules call for the operation of approximately 5,200 motor coach miles daily, and its motor coach operating expenses, including interest, depreciation and taxes, are 20 cents per mile.

The purpose of the motor coach operation is to enable the elimination of unprofitable train service. By offering motor coach service in substitution for local passenger train service, the road is saving money while at the same time maintaining a regular transportation service for its patrons. Train service has been eliminated on one stub line, while train service has been reduced on seven other runs. The monthly savings from these reductions in train service are estimated at $9,530, the estimated annual savings being $114,367.

The elimination of train service between Dubuque, Iowa, and East Dubuque, Wis., saves $1,808 a month, or $21,696 a year. Two trains taken off between Mt. Morris, Ill., and Oregon save $1,773 a month, or $21,272 a year. The saving on two discontinued trains between Galesburg, Ill., and Burlington, Iowa, is $1,557 a month, or $18,688 a year; on two trains between Burlington, Iowa, and Ottumwa, $898 a month, or $10,776 a year; on two trains between Albia, Iowa, and Osceola, $1,360 a month, or $16,324 a year; on two trains between Van Wert, Iowa, and Des Moines, $793 a month, or $9,516 a year; on two trains between Creston, Iowa, and Shenandoah, $1,311 a month, or $15,735 a year; on two trains between Villisca, Iowa, and Clarinda, $30 a month, or $360 a year.

In addition motor coach operation has enabled the elimination of certain stops by trains the operation of which is continued. The elimination of stops by train



Yellow Coach Operated Between Burlington and Galesburg

No. 3 between Burlington, Iowa, and Ottumwa saves $68 a month, or $816 a year. The elimination of stops by train No. 41 between Lincoln, Neb., and Grand Island, saves $165 a month or $1,980 a year. Thus the savings effected through the co-ordination of motor coach service with train service and the substitution of the one for the other aggregate $9,763 a month, or $117,156 a year.

No Through Service

Although it has what might be termed a main line extending from Kewanee, Ill., and Peoria entirely across the state of Iowa and into the state of Nebraska, to Grand Island and Red Cloud, the transportation company is not offering a long-haul or through motor coach service. Instead it is maintaining motor coach service on 17 individual routes, the motor coach schedules being arranged to supplement effectively the existing train service over the parallel railway lines rather than to connect with each other at junction points of the highway routes. The longest route operated by the transportation company is only 111 miles in length. Table I shows the motor coach routes operated by the transportation company, with their lengths.

The reason why the Burlington has abandoned the idea of offering long-haul motor coach service is that it has found, through its own experience, that motor coach operation in Burlington territory is not profitable in itself. This is borne out by the income account of the transportation company for the 11 months ended November 30, 1930, which shows total operating revenues of $267,089.04, total operating expenses of $356,880.35 and a net deficit from operations of $89,791.31. The taxes amounted to $17,544.72, while non-operating income totaled $6,127.17, making the net deficit $101,208.86.

Table I—Burlington Transportation Company Motor Coach Routes

		Miles
Dubuque, Ia.	East Dubuque, Ill.	1.1
Mt. Morris	Oregon, Ill.	7.3
Kewanee-Galva	Galesburg, Ill.	40.0
Peoria-Galesburg-Monmouth, Ill.	Burlington, Ia.	104.3
Burlington	Ottumwa, Ia.	76.9
Ottumwa	Osceola, Ia.	83.5
Des Moines-Osceola	Van Wert, Ia.	58.8
Osceola	Villisca, Ia.	81.0
Villisca	Balfour Jct., Ia.	47.7
Villisca	Clarinda, Ia.	15.5
Clarinda-Shenandoah-Council Bluffs-Ia.	Omaha, Neb.	86.3
Omaha	Lincoln, Neb.	61.0
Lincoln	Nebraska City, Neb.	56.7
Lincoln-York	Grand Island, Neb.	103.3
Lincoln-Fairmont	Hastings, Neb.	111.4
Hastings	Red Cloud, Neb.	43.3
Harvard-Clay Center	Superior, Neb.	45.9
	Total	1,024.0

How Service Is Improved

The manner in which the motor coach operation has enabled the railway to improve the service to its patrons, while at the same time effecting economies from which it will benefit, is indicated in the operation between Des Moines, Ia., and Osceola, paralleling a branch line of the railway. With the establishment of motor coach service, one train in each direction was discontinued, leaving two trains which operate daily except Sunday. The substitute motor coach service consists of two motor coach schedules operated eastbound daily and four westbound schedules, two of them operating on week days and two on Sundays. In other words, one extra schedule is being operated each way daily as a result of the co-ordination of the railway and highway service. Furthermore, the departure times have been spread so that on week days the eastbound service consists of a train from Osceola at 8:20 a.m., a motor coach at 10:50 a.m., a train at 3:55 p.m., and a motor coach at 8:30 p.m. Westbound the week-day service consists of a motor coach departure from Des Moines at 12:15 a.m., a train at 8:00 a.m., a motor coach at 1:10 p.m., and a train at 5:00 p.m.

An example of the use of motor coaches to supplement rather than to replace train service is afforded by the operation between Peoria, Ill., and Galesburg. To the three trains scheduled each way between these points, three round-trip motor coach schedules have been established. The present westbound service consists of a train departure from Peoria at 7:40 a.m., a motor coach departure at 8:45 a.m., another motor coach departure at 11:45 a.m., a train departure at 3:00 p.m., a motor coach departure at 4:30 p.m., and a train departure at 7:45 p.m. The running time of the motor coaches over the 58-mile route is 2 hr. 10 min., while the trains make the run in approximately 1 hr. 25 min. The motor coach service on this line is well patronized, the transportation company having carried 7,541 through passengers between Peoria and Galesburg in the 12 months from December, 1929, to November, 1930, inclusive.

Another instance in which motor coaches have been used to increase the frequency of service between points where there is a heavy flow of traffic is found in the operations between Omaha, Neb., and Lincoln. Seven trains operate daily from Omaha to Lincoln. To this service have been added 8 motor coach schedules, giving a total of 15 train and motor coach departures from Omaha for Lincoln daily. A train leaves Omaha at 7:50 a.m., a motor coach at 8:00 a.m., a train at 9:10 a.m., a motor coach at 10:00 a.m., a train at 10:45 a.m., a motor coach at 12 noon, a train at 1:10 p.m., a motor coach at 2:00 p.m., another motor coach at 4:00 p.m., a train at 4:25 p.m., a motor coach at 6:00 p.m., a motor coach at 7:30 p.m., a motor coach at 9:30 p.m., a train at 10:15 p.m., and a train at 11:50 p.m. All of the motor coach schedules are not operated by the Burlington Transportation Company, however. Through an agreement with the Interstate Transit Lines, subsidiary of the Union Pacific, for the joint operation of this line, to prevent excessive duplication of motor coach schedules, the motor coaches leaving Omaha at 8:00 a.m., 12 noon, 4:00 p.m., and 7:30 p.m. are operated by the Interstate Transit Lines, the other four motor coach schedules being operated by the Burlington Transportation Company. It will be seen that the co-ordination of motor coach and train service between Omaha and Lincoln has brought about almost hourly service between these points.

Operating Organization and Practices

W. E. Fuller, assistant to the executive vice president of the Burlington, is vice president in charge of the operations of the transportation company. A. Cotsworth, Jr., passenger traffic manager of the railway, is traffic manager of the transportation company. In addition to these and other railway officers who devote part of their time to the supervision of transportation company activities, the transportation company has its own general manager, F. D. Hite, with headquarters at Omaha, Neb. H. W. Stewart, assistant manager of operations of the transportation company, is located at Galesburg, while J. D. Baker, general passenger agent of the transportation company, has his headquarters at Chicago.

The basic rate of fare for transportation in the motor coaches of the transportation company is 3 cents a mile, and tickets for motor coach transportation are sold not only in motor coach stations but also in Bur-

lington railway stations. Railway tickets are honored in the transportation company's coaches, but motor coach tickets are not good on trains.

The transportation company includes in its accounts payments for the use of station facilities at terminal points where the Burlington is only a part owner in the station. The transportation company also includes in its accounts the wages and expenses of employees devoting all or part of their time to the transportation company, where the service rendered is of any substantial amount and can be accurately accounted. It also pays for the rental of part of the roundhouse at Galesburg, which is used for garage purposes. The transportation company does not pay for the services performed for it at stations owned outright by the Burlington, at terminal as well as intermediate points, nor for any part of the salaries and expenses of Burlington officers and department heads for the services performed by them.

Motor Transport Hearing at Omaha

WITH a hearing at Omaha, Neb., which began on February 14 and adjourned on February 18, the Interstate Commerce Commission brought nearly to a conclusion its series of hearings in Docket 23,400, Co-ordination of Motor Transportation. Examiner Leo J. Flynn presided at the Omaha hearing, at which officers of the Chicago, Milwaukee, St. Paul & Pacific, the Chicago & North Western and the Union Pacific were the principal railway witnesses. Examiner Albert E. Stephan assisted Examiner Flynn in the questioning of witnesses.

W. W. K. Sparrow, vice-president of the Milwaukee, who was the first railway witness, read a statement showing the effect of motor truck and motor coach operation upon the traffic and revenues of the Milwaukee. This showed a steady decline in passenger traffic and a failure on the part of l.c.l. freight traffic to increase over a period of time in which carload traffic gained. He showed the growth of motor coach and truck transportation in the states served by the Milwaukee, basing his conclusions on the registrations of motor vehicles in those states. Mr. Sparrow recommended regulation of interstate motor carriers and favored more extensive co-ordination of railway and motor transportation.

H. W. Beyers, vice-president in charge of traffic of the Chicago & North Western, testified concerning the competition of common carrier and contract carrier motor trucks for freight traffic, and described the North Western's losses of business to these competitors.

North Western Testimony

G. W. Hand, assistant to the president of the North Western, described in detail the participation of the North Western in motor coach operation. He said that the North Western first became financially interested in motor coach operation on July 1, 1929, when it acquired one-third of the capital stock of the Interstate Transit Lines, joining with the Union Pacific in the acquisition of this company. Considerations which led the North Western to take this step were the change of competitive motor coach lines from short-haul to long-haul carriers, and the consequent attraction of trans-continental traffic from the railway to the highway; the likelihood that motor coach operation would continue and would further expand; the desirability that the railway do something to minimize the resultant loss of traffic; and the necessity of complete co-ordination of railway and highway service, if wasteful duplication were to be avoided.

To provide for simplicity of control and greater efficiency, the North Western and the Union Pacific decided to operate the Interstate Transit Lines as a single unit in the territories of the two railways. All of the routes of the Interstate Transit Lines, except the one from Omaha, Neb., to Kansas City, Mo., were in North Western territory, and the lines to the south and west of Omaha were also in Union Pacific territory.

The next step taken in North Western territory was to purchase equipment and establish a line between Omaha and Chicago, paralleling the main line of the North Western. A certificate was granted by the Board of Railroad Commissioners of Iowa, covering that part of the line in the state of Iowa, but it contained restrictions prohibiting the transportation of local passengers between a number of points, these restrictions hindering the co-ordination of motor coach and railway service. Mr. Hand said that substantially nothing in the way of co-ordination can be accomplished until there is complete freedom to handle passengers by rail and motor coach, through joint service, joint tariffs, and freedom of interchange at any station within the territory served.

Later the motor coach operation of the Sioux Falls Traction Company was taken over by the Interstate Transit Lines, through service was established between Omaha and Minneapolis, Minn., and very recently the Interstate Transit Lines purchased the motor coach operation of the Fort Dodge, Des Moines & Southern Transportation Company, covering 515 miles of routes in the vicinity of Des Moines, Iowa. Interstate Transit Lines is now operating 1,879 miles of routes in North Western territory.

Mr. Hand said that the development of branch lines to operate in local service and as feeders to the main routes has not progressed very far. Likewise practically nothing has been done in the direction of operating local schedules on the through routes. He said that unless branch line and local service can be established in a substantial way, the motor coach operation will not afford the benefits anticipated from co-ordination.

Further developments, he said, depend upon the extension of hard-surfaced highways along the branch lines of the railway, the stability of rates, and the character of regulation imposed upon motor coach operators. Mr. Hand said that there must be either complete stability and regulation of motor coach lines, or the railways must have complete freedom to inaugurate, modify, or change their rates and service, in which they participate in any way with motor coach operations, in all ways that are now open to independent operators. Further development of the co-ordination of railway and highway service, according to Mr. Hand, also depends upon complete freedom to establish joint rail and motor coach service, without limitations on the use of tickets, so that passengers can be carried in both trains and motor coaches interchangeably. Only in this way, concluded Mr. Hand, is it possible to reduce duplication of service and to avoid waste.

Union Pacific Testimony

J. L. Haugh, vice-president and assistant to the president of the Union Pacific, was the only witness for

(*Continued on page 464*)

Rail-Truck Service Passes Experimental Stage

Results of first year of Texas & Pacific Motor Transport Company's freight-carrying operations — Problems now confronted

By T. E. Huffman

General Freight Agent, Texas & Pacific Motor Transport Co.

THE Texas & Pacific Motor Transport Company, which made the first large-scale experiment of a Class I railroad in combined motor-rail-motor service for l.c.l. freight, completed its first year of operation in November, 1930. The purpose of this article is to give briefly the results of this first year of operation and to outline in a general way the problems now confronted. A detailed article about the motor transport company appeared in the May 24, 1930, issue of *Railway Age* (Motor Transport Section).

Briefly, the system operates as follows. The motor transport company uses jointly the railway company's facilities and employees, and renders through the medium of contract truck operators pick-up service at stations of origin. At the shipper's place of business, a through bill of lading is issued by the agent of the motor transport company and the freight is hauled to the railway station. It is there loaded in set-out package cars (or way cars where the tonnage does not justify an exclusive car for each of several smaller points) and transported to destination or set-out point in fast merchandise trains. At destination the motor transport company's contract truck operator delivers the freight from the railroad station to the consignee's door. For this service the rail depot-to-depot rates are assessed.

Through proper co-ordination of schedules, making possible late receipt of freight at distributing centers (6:00 p. m.) and over-night transportation to destination with early morning delivery, strong competition is offered for the business which the highway truck lines took from the railroads by giving this pick-up and delivery service.

Various Rates and Results

At the start it was believed the public would prefer to patronize the motor transport company at even higher rates than those charged by the highway truck lines, owing to its reliability and financial responsibility, and especially its dependable operation regardless of weather conditions. The rates were, therefore, in the first tariff, 14.1 cents higher than the rail depot-to-depot first class rate, 17 cents higher than second class, 22 cents higher than third class, and 28 cents higher than fourth class, which differential appeared adequate to cover the cost of the pick-up and delivery service. These rates remained in effect about two months and were about 19 cents per 100 lb. higher than the general run of highway truck charges in effect at that time. The railroad commission of Texas had not at that time assumed jurisdiction over highway truck operations, leaving them free to bargain for business by reducing their rates to a point where the most intensive advertising, solicitation and service by the motor transport company failed to produce any appreciable amount of business.

To meet this competition, the motor company's rates were reduced to 110, 115, 120, and 125 per cent of the rail depot-to-depot rates, and with this change the operation was extended to cover some 20 additional stations where truck competition was being felt most keenly. These rates remained in effect about one month, and again it was found that we were unable to attract the tonnage from the truck companies due to their lowering their rates as necessary to secure the particular tonnage offered for movement. The motor transport company's rates were then reduced to the level of the rail depot-to-depot rates. In the meantime, the railroad commission had assumed jurisdiction over common carrier trucks and required them to charge this same rate, which placed competition on a service basis rather than a price basis alone, and an increase in the business of the transport company was noticed immediately.

The depot-to-depot rates have since been made to apply to, from, and between all stations in Texas on the Texas & Pacific and subsidiary lines, as well as to, from, and between all stations on these lines and stations on the Missouri Pacific Lines in Texas, except south of Robstown. These successive reductions in rates and the extension of service were compelled by truck competition. During 1930, three major Class I railroads in Texas instituted operations similar to ours and exchange of interline billing is being considered, but other than between the T. & P. and the Missouri Pacific no definite arrangements have been made.

Increase in Tonnage

Figure 1 illustrates the steady increase in tonnage handled by the motor transport company. The average tonnage was calculated for 15 months, September, 1929, to November, 1930, inclusive. Using this monthly average as 100 per cent, the tonnage for each month was figured in terms of percentage of this monthly average. The cause of the light business during the first three months was the assessment of rates higher than those of the truck lines, as explained. Since the rates of the highway Class A (fixed route, common carrier) trucks and the

	Net Sales January to June 1930 vs 1929	Net Sales July to December 1930 vs 1929
Groceries	Decrease 3.3%	Decrease 13.1%
Dry Goods	" 23.0%	" 36.7%
Farm Implements	" 31.2%	" 42.0%
Hardware	" 16.8%	" 27.9%
Drugs	" 16.3%	" 19.7%

motor transport company have been made the same, the chart shows a steady increase in our tonnage, indicating that the motor transport company can compete successfully with regulated highway transportation. This growth has developed in the face of general business depression, which in this section, according to statistics of the Eleventh District Federal Reserve Bank, on principal commodities (wholesale) handled by the motor transport company, resulted as shown in the foregoing table.

A careful check for the months from December, 1929, to March, 1930, inclusive, at two of the principal distributing centers, where 75 per cent of the motor transport company's tonnage originates, showed that approximately 85 per cent of the tonnage handled by the transport company was recovered from competitive motor trucks. In some instances the recovery was larger; this was borne out by a check of an average day's shipments made by a large wholesale house. Forty-four of 45 shipments handled by the transport company formerly would have moved by truck. A conservative estimate of the recovered tonnage now moving via the motor transport company for the account of another large shipper, based on a close check for several months, is 97 per cent. As the public becomes better acquainted with the new service, an increasing amount of the tonnage now moving by rail probably will be absorbed. The estimates of business recovered are supported by returns filed by the truck operators with the railroad commission. These statements, which are a matter of public record, indicate that highway truck lines competing with the motor transport company in most instances have experienced heavily decreased business. Their purchases of new equipment during the past year were very small. In many instances they operated at a loss; several lines ceased operation.

Trucking Practices

Careful study was made as to the pick-up and delivery service. In view of the heavy investment necessary to acquire outright the number of trucks necessary, it was decided to contract for the trucking service. These pick-up and delivery contracts have been placed at prices ranging from 5 to 10 cents per 100 lb., and 85 per cent of them are at 6 cents or less. No provision as to an arbitrary minimum weight or charge is made.

Seventy-four per cent of the outbound tonnage is drayed to the freight stations by the contract truck operators, and the remaining 26 per cent is brought to the depots by consignors along with shipments for destinations where the motor transport service is not available. By routing such shipments via the motor transport company, the consignor secures the benefit of delivery for his customer at destination, but no allowance is made where drayage is performed by either shipper or consignee. About 8 per cent of the inbound tonnage is accepted by consignees at the depots and the remainder is delivered by the contract trucks. The payments to these truck operators are divided approximately 53 per cent for pick-up service and 47 per cent for delivery, although the amount of tonnage picked up is about 45 per cent of the total. The difference is occasioned by the higher rates prevailing in the larger cities where the bulk of the tonnage originates.

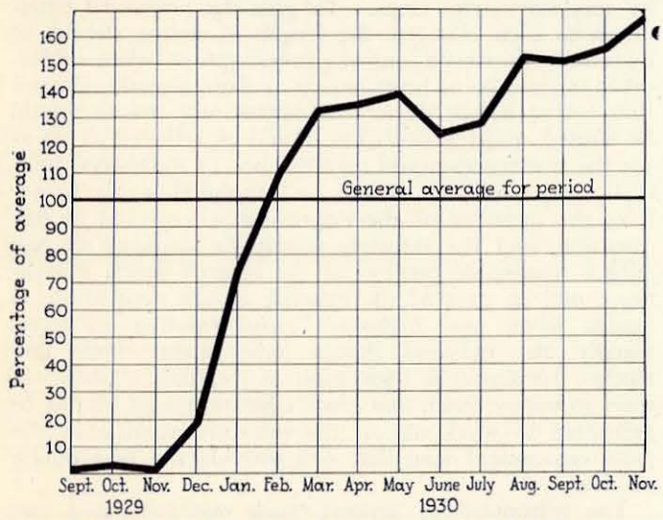


Fig. 1—Trend of Motor Transport Company's Volume of Traffic

One of the experiments tried in the larger cities was the establishment of zones beyond which pick-up and delivery service was not performed. It was necessary to abandon this because the highway trucks picked up or delivered anywhere within the city limits at no additional charge. That this precluded the possibility of the motor transport company securing any tonnage outside the zone area was shown by the increase in tonnage and the numerous receivers and shippers outside the former zone area who began to favor the motor transport company following the lifting of this restriction.

The motor transport company competes with Class A trucks on common ground. The Class B and contract trucks are free to bargain for traffic and operate wherever they desire. They can avoid unremunerative tonnage which is thereby forced to the motor transport company and other common carriers. If the most intense solicitation on the basis of service is to bear fruit against this competition, all tonnage offered by 6 p. m. or later must be dispatched for delivery early the following morning. After all tonnage has been loaded, the merchandise cars are placed in a co-ordinated merchandise train for overnight handling to destination. Early morning delivery at destination is fully as important as prompt dispatch from point of origin. This is facilitated by the use of a 6-ply combination waybill, delivery receipt and station record, which is prepared in manifold at the billing station. At many points station forces are brought on duty at 7 a. m. to provide the early delivery demanded by consignees. Where local trains operate triweekly, daily delivery at way stations is provided by loading the package cars to work from the initial terminal of the local run each day.

C. O. D. service offered by the motor transport company has become very popular. The convenience of having the truck driver make the collection on delivery of C. O. D. shipments has caused the "shipper's order" handling to be practically abandoned. Local agents are authorized to pay legitimate claims on presentation, when they are properly supported and no complications have arisen. This practice is highly satisfactory and has attracted considerable business.

Conclusions

The elements of successful operation are:

1. The motor transport company can compete successfully with regulated highway truck lines on the basis of service and equal rates.

2. Freight must be received until the close of the shippers' business day, generally 6 p. m. or later, for dispatch the same day.

3. Store-door delivery early the following morning must be given in a radius of approximately 250 miles, this being the general extent of overnight truck transportation from distributing centers.

4. Daily delivery must be accomplished at all stations. Where local trains operate tri-weekly, way cars must be loaded to work in opposite directions on alternate days, being handled from the distributing center to local terminals in overnight trains.

5. It is very desirable that local agents have authority to pay properly supported legitimate claims on presentation.

6. Return of C. O. D. collections on the same day that deliveries are accomplished creates a favorable impression with shippers.

7. The most successful solicitation is on a basis of service and responsibilty. Solicitation of consignees by local agents is especially effective.

Motor Transport Hearing at Omaha

(Continued from page 461)

that road. Mr. Haugh described in detail the activities of the Union Pacific in motor coach operation and offered a number of suggestions concerning the further co-ordination of railway and highway service. The Union Pacific, he said, first engaged in motor coach operation in 1925, when it substituted motor coach service for train service between Pendleton, Ore., and Walla Walla, Wash. In the last four months of 1925, there was a net profit from the motor coach operation of $4,174.20, as compared with a net loss during the last four months of 1924, when steam trains were operated, of $3,707.85. The motor coach service was extended from Pendleton to Portland, Ore., in July, 1927, and a saving of $52,740 per annum in train operating expenses was accomplished.

Mr. Haugh described the development of long-distance motor coach competition in 1929, by bus lines operating in Union Pacific territory, mentioning one operation which paralleled the main line of the Union Pacific from Omaha west through Denver, Colo., and Salt Lake City, Utah, to Los Angeles, Cal., and to Portland, and Spokane, Wash.; also from Kansas City to Denver. He said that the Union Pacific's position in the passenger transportation field was menaced because of the ability of its highway competitor to make varying rates, and to change its rates at will. At the same time legislation was pending in Congress which promised to make it difficult for the Union Pacific to engage in motor coach operation on the highways, hundreds of miles of which are located upon the Union Pacific right-of-way furnished to the public without charge.

The Union Pacific decided in February, 1929, to engage extensively in motor coach operation. It had in mind not only the provision of motor coach service in substitution for train service, but it also believed that motor coach operation would become profitable in itself after a period of development had passed. As described by Mr. Hand, the Union Pacific joined with the Chicago & North Western in the acquisition of the Interstate Transit Lines, and authority was secured from various state commissions for the establishment of long-distance service from Chicago through Omaha to Denver, Salt Lake City, Portland and Los Angeles, and from Kansas City to Denver. A line was established from Kansas City to St. Louis, Mo., in order to obtain eastern connections.

Union Pacific Stages, Inc., which is owned by the Oregon Short Line, was formed to handle the motor coach operation between Salt Lake City, Portland, and Spokane. Interstate Transit Lines provides the service between Chicago and St. Louis on the east and Los Angeles on the west, through Denver and Salt Lake City. Since the inauguration of its through service, the Union Pacific has taken off passenger trains aggregating 2,276,956 miles per annum. Motor coach operation has cost approximately 28 cents per mile over the entire system, and Mr. Haugh stated that this cost probably would be reduced after the system has been fully developed. The Union Pacific also has a subsidiary, the Utah Parks Company, which operates motor coaches between Cedar City, Utah, and the national parks in southern Utah and northern Arizona, and has another subsidiary, the Union Pacific Stage Company (of California), which operates motor coaches in substitution for steam train service on lines radiating from its East Los Angeles passenger station.

With respect to truck operation, Mr. Haugh said that the Union Pacific has taken no steps as yet in this direction. Study of the situation, he said, has convinced officers of the Union Pacific that motor truck service within a radius of perhaps 50 miles is more economical and convenient than railway service in the distribution of l.c.l. freight. On the other hand, it is more economical to handle the carload and long-haul traffic by rail. Mr. Haugh said the situation is changing so in the truck transportation field that it is difficult now to work out a plan of co-ordination of rail and truck service which will meet all conditions satisfactorily. Substantial inroads are being made by contract trucks into the business of common carrier trucks, and private trucks are also coming into the field in increasing numbers, taking business from both common carrier and contract trucks. Burdensome legislation applying to common carrier and contract trucks, Mr. Haugh said, will surely further increase the traffic handled by private trucks.

Rail-Truck Co-ordination Should be Unrestricted

In conclusion, Mr. Haugh suggested that there should be no rigid restrictions which would hinder the co-ordination of railway and truck service, since this must be experimental for a few years. The railroads should be permitted to employ motor coaches and trucks and to allow compensation to them for their services, even in the form of divisions of rates, if necessary. It will be necessary for the railroads to adjust their rates from distribution points over distances of possibly 400 miles, and it may be necessary to reach the proper rate level by successive trial steps. To give the necessary expedition to such changes, the length of notice should be materially shortened, and the investigation, when undertaken, should be as brief and at as little expense as possible. The length of motor coaches and trucks should be limited, and the railroads should be relieved of taxes for the construction and maintenance of highways. Federal valuation work should be simplified so as to relieve the railways of the expense now required in this direction, and the railways should be required to pay only a reasonable portion of the cost of grade separations, and no part of the expense of the separation of grades when new highways cross existing railways. Finally, the railways should have respite from any further burdensome legislation or regulation with respect to motor coach and truck operation, and should be permitted to work out of the present situation in the most economical way that will provide the best public service.

The testimony of several truck operators and one shipper closed the Omaha hearing.

The final hearing in Docket 23,400 will be held at Washington, D. C., beginning March 4.

Communications and Books...

Can Waterways and Motor Coaches Win A War?

SIGNAL MOUNTAIN, TENN.

TO THE EDITOR:

In spite of World Courts, Leagues of Nations, Disarmament Conferences and Peace Propaganda, it is within the realm of possibility that America may, at a comparatively early date, be forced to defend her territory from the advance of a foreign invader.

In such an event, the burden of transporting troops and supplies will fall—not upon government-subsidized waterway, airway and highway transportation—but will depend almost entirely upon our railways.

For this reason—if for none other—it behooves every thoughtful American to demand that the growth and efficiency of our railroads be not impaired by reason of unjust paternalism on the part of our government towards these less essential modes of transportation.

CHAS. E. NEWELL.

How Consuls Treat Tourists

NEW YORK.

TO THE EDITOR:

Referring to your editorial entitled "Tourists from Abroad" in the *Railway Age* of February 7:

Perhaps to Mr. Dyer, Congressman from Missouri and sponsor of the "Travel Division" bill in Congress, it all looks rather simple to create such a division and thus to promote travel. I wonder if Congressman Dyer has been abroad and if he had to go through all the motions and tests which prospective immigrants, travelers and tourists have to go through before being able to step on United States soil. That is one of the great handicaps to overcome.

As long as such red tape and the attitude on the part of the United States consulates abroad in considering all applicants in the light of immigrants exists not much increase in travel by real bona fide tourists can be expected. It is conceded that the consuls often have a difficult task to perform due to the fact that the number of applicants is very great. An instance may be cited of the case of a tourist party last year brought over by a steamship company for a temporary visit, as a result of which almost half of the "tourists" failed to show up when the time came to return to Europe. Now the steamship line and the government are looking for them. The booklet issued by the Department of Commerce mentioned in your article is just a survey, and, though very clear and comprehensive, does not touch several of the main obstacles which now prevent increased travel to the United States.

Nevertheless, I hope that present and new organizations are successful in finding some way to boost westbound travel, particularly in view of the coming Chicago Exposition. Such an effort will benefit the railroads, and give them much needed passengers and more revenue.

FRED EIDENBENZ.

New Books

Proceedings of the International Railway General Foremen's Association. Compiled and published by Wm. Hall, secretary, Winona, Minn. 220 pages, 6 in. by 9 in. Bound in black leather.

A bit of early history of the International Railway General Foremen's Association as presented by E. C. Cook, managing editor of the Railway Journal, before the convention of the association held at Chicago, September 16, 17, 18 and 19, is contained in the proceedings for this meeting which marked the silver anniversary of the founding of the association. The topics discussed were Engine Truck Maintenance and Lubrication; Cost of Material Delays to Locomotives and Cars; Stabilization of Mechanical Shop Forces; Inspection, Maintenance and Repairs to Gas-Electric Rail Cars; The General Foreman's Contribution to Fuel Economy, and Better Maintenance of Passenger Car Equipment. The addresses were by President H. B. Sunderman (C. & O.); L. Richardson (B. & M.); J. A. Anderson (C., M., St. P. & P.); William D. Saltiel (City Attorney of Chicago); H. C. Stevens (Wabash), and E. Von Bergen (Illinois Central).

Book of Standards for Testing Materials. Two volumes, 6 in. by 9 in., totaling 2,214 pages. Bound in cloth or in leather. Published by the American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Both volumes in cloth, $14; in leather, $17. Can be purchased separately.

This publication presents in printed form the adopted standards of the American Society for Testing Materials. The book of standards is issued triennially, and the standards adopted by the society in the intervening years are published as supplements to be incorporated in the succeeding books of standards.

The 1930 standards are published in two volumes, Part 1, and Part 2, both of which deal with many subjects of interest in the railway field. Together they contain 427 standard specifications, in addition to methods of tests, definitions of terms and recommended practices. Part 1, which has 1,000 pages, deals specifically with metals and includes specifications relative to such products as steel, wrought iron, pig and cast iron, ferro alloys, and non-ferrous metals, while Part 2, which has 1,214 pages, deals with non-metallic substances, including cement, concrete and concrete aggregates, brick, preservative coatings, petroleum products and lubricants, water-proofing and roofing materials, electrical insulating materials, and such other products as coal and timber.

For convenience in using the book, each part is provided with two tables of contents, one a listing of the standards in the order in which they appear in the volume, grouped according to the subjects to which they relate, and the other, a listing of the standards in numeric sequence of their serial designations. In addition to these tables, each part contains a complete subject index.

Books and Articles of Special Interest to Railroaders

(Compiled by Elizabeth Cullen, Reference Librarian, Bureau of Railway Economics, Washington, D. C.)

Books and Pamphlets

Economic Survey of the Cottonseed Products Industry. A preliminary report, the transportation cost figures in which may be of interest. Dated Jan. 15, 1931. 22 p. charts. Pub. by National Cottonseed Products Association, Inc., Memphis, Tenn. *Apply.*

End of Steel, by Courtney Riley Cooper. A novel of recent railroad building in northern Canada. 281 p. Pub. by Farrar & Rinehart, New York City. $2.

Index to A.S.T.M. Standards and Tentative Standards. Constitutes a combined index to all A.S.T.M. standards and tentative standards in effect as of September, 1930. The index is designed to be of service to those familiar with the society's standards in locating any specification or method of test in the bound publications in which it appears or to those interested in ascertaining if the society has issued any standards on a specific subject. It contains a complete list of the 427 standards

and 155 tentative standards which appear in the 1930 A.S.T.M. Year Book and in both parts of the 1930 Book of Standards. A price list gives the prices of the bound publications in which the standards and tentative standards appear and the prices of standards in separate pamphlet form. 114 p. Pub. by the American Society for Testing Materials, 1315 Spruce street, Philadelphia, Pa.

Preliminary Report of Study of Railroad Consolidations and Unifications Pursuant to Senate Resolution No. 290, 71st Congress, Submitted to Committee on Interstate Commerce [U. S. Senate], by Wm. C. Green, Special Counsel. "Printed for the use of the Committee on Interstate Commerce." 2 parts. Pub. by U. S. Govt. Print. Off., Washington, D. C. "Committee Print."

Rationalization of German Industry. A comprehensive review of recent developments in various industries. 182 p. Pub. by National Industrial Conference Board, Inc., $3.

Twenty-Fifth Report of the Corporation Commission of North Carolina. Covers the biennial period, 1929-1930, and includes, among other discussions, a survey of the commission's work in connection with the regulation of rail and of highway carriers. 496 p.

Union-Management Coöperation on the Railroads, by Louis Aubrey Wood. The seventh publication on the William McKean Brown Memorial Publication Fund at Yale. It discusses comprehensively the scope of the co-operative movement in the United States and Canada, historical background, and origin and development of union-management co-operation, attitudes of management and men toward plan, various types of suggestions, improvement of morale, problems associated with measurement of gains, stabilizing of employment, fair sharing of gains, apprentice training under co-operation, co-operation in other railroad departments, and significance of the movement on the railroads. Indexed. 326 p. Pub. by Yale University Press, New Haven, Conn., $4.

Periodical Articles

The Present Status of the Study of Public Administration in the United States, by John M. Gaus. ". . . Our constitutional system, with its separation and division of powers, invites extra-legal associations for co-ordination and the fixing of standards common to all units of government. Time-space relations, changing with technology, have given us new units in the metropolitan area and geographic region. . . . The successive invasions of immigrants have come to an end, the free lands are gone, and a period of physical stability which seems to lie ahead offers an opportunity for taking stock and planning under more static conditions. . . ." p. 123. American Political Science Review, February, 1931, p. 120-134.

Survey of Airport Investments and Anticipated Expenditures in the United States Completed by Aeronautics Branch. Includes tables showing total airport expenditures by states, airport expenditures according to population classes of cities, distribution of airports according to population of cities, items of capital expenditures by states for 450 municipal, commercial and private airports furnishing data to Aeronautics Branch, items of capital expenditures for section of country as furnished by 450 municipal, commercial, and private airports. Air Commerce Bulletin, February 2, 1931, p. 379-391.

Weather Conditions and Results in Earlier Years. A survey of weather and its effect on traffic from 1930 back to 1920. Commercial & Financial Chronicle, February 21, 1931, p. 1292-1294.

William Z. Ripley on the Future of New England Railroads. New England problems in the light of the four-system consolidation plan. Boston Evening Transcript, February 21, 1931, part 3, p. 1 (with map), 4.

Wings of Tomorrow, by Juan de la Cierva. The inventor of the auto-giro discusses the limitations of present day planes and air service and concludes "that the whirling vanes of the auto-giro are the wings of tomorrow." Forum, March, 1931, p. 172-177.

Looking Backward . . .

Fifty Years Ago

The negotiations for the settlement of passenger traffic competition between Chicago and St. Louis, and between Chicago and St. Louis and Missouri river points have so far proved fruitless. The several roads some time ago ceased contending for the traffic by cut rates, but the Chicago & Alton had sold a large number of unlimited tickets between St. Louis and Kansas City, and the Wabash probably a still larger number between Chicago and St. Louis at a little more than half the regular rates. The ticket brokers' offices are full of these tickets and the two roads contend that they cannot sell tickets now at prices much higher than those at which the unlimited tickets were sold without throwing all the passenger business into the hands of the brokers. Unanimity is required among all the roads in that territory to make an agreement binding, and a meeting at Chicago on February 22 was adjourned without definite action.—*Railroad Gazette*, February 25, 1881.

Twenty-Five Years Ago

The right of the initial railway to route freight which is destined to travel over two or more lines at a joint rate has been finally established by a decision of the United States supreme court, rendered on February 26, in the cases of the Atchison, Topeka & Santa Fe and the Southern Pacific against the Interstate Commerce Commission. These cases are the last of a series known as the citrus fruit cases, which originated in complaints against the Santa Fe and the Southern Pacific when these roads sought on January 1, 1900, to end rebates on citrus fruits by means of a control of the routing. These shippers had been using their control of the routing to play the railways against one another, and thus extract, it was claimed, large rebates, greatly to the disadvantage of the small shippers.—*Railway Age*, March 2, 1906.

The present year will be one of great activity in railway building in Canada. The Grand Trunk Pacific [now part of the Canadian National] has just awarded contracts for 457 miles of its main line, which, with the 275 miles from Portage la Prairie, Man., west and the Lake Superior branch, 210 miles long, previously awarded, make a total of 942 miles under contract to date. This carries the main line as far west as Edmonton, Alta. The Transcontinental Railway Commissioners are receiving bids for 395 miles of the line between Moncton, N. B., and Winnipeg, Man., but which will be operated by the Grand Trunk Pacific when completed. The Canadian Pacific has nearly 500 miles of branch lines projected or under construction, the most important of which is the Toronto-Sudbury line in Ontario, 226 miles long.—*Railway Age*, March 2, 1906.

Ten Years Ago

Eighty-eight railroads, operating 79,151 miles of line, failed to earn their operating expenses and taxes during December, 1920. These 88 roads had a deficit of $20,173,000, while 114 roads, operating 153,289 miles, earned a net operating income of $37,210,000, and the entire group had a net operating income for the month at the rate of 1.17 per cent on the valuation fixed by the Interstate Commerce Commission for the purposes of the rate case.—*Railway Age*, February 25, 1921.

The principal action taken by the National Association of Railroad Tie Producers at San Francisco on January 28 was the adoption of specifications for cross ties. These specifications differ in only a few particulars from those which the Tie committee of the American Railway Engineering Association will recommend to that organization for adoption, and are practically identical with those of the United States Railroad Administration.—*Railway Age*, February 25, 1921.

Odds and Ends . . .

Only Woman Train Caller?

The Illinois Central advances the claim that Lula Reid, colored train caller in the I. C. station at Vicksburg, Miss., is the only woman train caller in the country.

California Golfers

The Southern Pacific now has the largest "Hole-in-One" Club of any railway, since J. E. Warren, assistant to the general passenger traffic manager, sank his tee shot at the 165-yard second hole of the Lake Chabot Golf Course.

Railway Basketeer

Robert McCarnes, of Northwestern University, who is rated as the best center in Western Conference basketball, is a furloughed truckman of the Pennsylvania, who, when he is at home, operates at the freight station of the Pennsylvania at Logansport, Ind.

Hindu Prejudice

The railway station at Trivandrum, which is the capital of the native state of Travancore in India, is 3½ miles away from town. The reason for this rather unusual location is that the maharajah prefers not to profane his sandals by crossing the rails when he goes to take his daily bath.

Dispatcher Has Broadcasting Station

Until some rival claimant appears, C. H. Swanson, train dispatcher for the Louisville & Nashville at Etowah, Tenn., holds the title of being the only railroader who operates a broadcasting station. When not using the Morse code in dispatching trains, Swanson is busy using the Continental code over his station, W-4-AID.

A Movie Fireman

When Grant Withers was assigned to one of the leading parts in "Other Men's Women," a railroading movie, he needed little coaching for his role. Before crashing into the movies, Withers spent some four years as a fireman on five or six railroads in the West, so that it was no particular stunt for him to act naturally in the locomotive cab.

Information from Germany

In connection with the picture of the old 6-2-0 Crampton locomotive of early days on the Camden & Amboy, published in the issue of November 22, Rudolf Kreutzer, of Kassel, Germany, sends in a complete description, which is corroborated in every detail by other descriptions sent in from this country. It is interesting that this 90-year old American locomotive should have been recognized by some one not in the railway business and situated some 4,000 miles from the railway on which the locomotive once ran.

A Long Memory

Forty-one years is a long time to J. W. Lambert, block operator for the Pennsylvania at Roxanna, Ohio, but to his former associate, J. Riley, now of Hampstead, Pa., this long period is apparently scarcely more than 41 days. It seems that Lambert and Riley worked together on the Pennsylvania at West Jefferson, Ohio, in 1890. Riley has since become a carpenter "specializing in fine work such as putting locks on bed room dressers," as his shingle reads. Recently he found a key in the bottom of his tool box which he assures Mr. Lambert belongs with the lock on the coal house at West Jefferson.

"Thinking you may still have the lock in your possession, I am sending the key to you today," writes Mr. Riley.

Mr. Lambert says that he left West Jefferson on December 11, 1890, so it must have been before that that the key was carried away. He has searched for some trace of the missing lock, but with no success. For that matter, he cannot even remember Riley.

Railroad With Line of 11 Miles Wants to Quit

The Chicago, Harvard & Geneva Lake, 11 miles long and operating with one electric locomotive and 12 box cars, recently petitioned the Interstate Commerce Commission for permission to suspend service. William McKinley, president of the little road, told Examiner William A. Disque that all officers and directors served without salary. One man is given a salary, he said, but acts as vice-president, operating manager and sometimes as conductor. He receives $3,600 a year. He asserted the road lost over $20,000 in 1930.

Pioneering in Germany

While it is not particularly uncommon in this country for a railway to create a new town by the expedient of locating shops or a division point at some place previously uninhabited, Europe is not ordinarily regarded as the place for such pioneering, in view of the ancient civilization existing there. However, as a result of the war, a whole series of new borders was set up, and it was necessary for the railways to establish interchange yards at these new borders. In the case of the main line between Berlin and Warsaw, Poland, the former Russian-German border was moved west a great many miles, and is now the Polish-German frontier. There was nothing at all in the way of a settlement at the point where the railway crosses the boundary, and it was necessary for the German State Railways to establish an entirely new town, known as Neu Bentschen, at that point. In addition to railway facilities, the company built a complete city which now has a population of approximately 1,500 persons. An interchange amounting to 10,300 carloads annually, together with a large tonnage of less than carload freight is now handled at this point.

Early Railroading

According to the annual report of the Baltimore & Ohio of 1838, railroad wages differed considerably from those of today. The "resident" engineman and agent got $3 per day and "ticket masters," $700 per year. There was a "first engineman," who drove passenger trains. He, so the report tells us, was "selected for his superior skill and character." His salary was $2 per day. The "second engineman" "ran with the burthen" (freight train). His pay was $1.50 per day. There was one brakeman for every two cars; it was his duty to attend to the baggage, and he received $1 a day. Two blacksmiths were engaged in the repair shop. Their job was to shoe the horses, and their pay, $1.50 per day each. There was one carpenter who engaged in repairing the railroad and erecting bridges. He earned $1.75 per day. The six horse drivers received $30 per month, each. And the "Yardmaster" who "attended the horse establishments," got $1.50 per day. Trackmen received $20 per month; they were engaged in repairing the railroad, and there were six of them in service. With these came 24 laborers who received the same salary. The "ticket masters" sold the tickets, "giving the right of passage from their own stations to the various stopping places on the road." The fare was received by the conductor, who returned it to the ticket master at the end of the trip. And the ticket master then entered this in his book, together with "the name of the locomotive engine, the date of the trip, the time of starting and the time occupied in the trip." Also he entered the number of cars, the number of passengers, the amounts received from passengers and baggage. Baggage was transported at the rate of 2½ cents per mile for every 100 lb. over 50 lb. for each person.

NEWS

Maltbie Sees Railroads Facing Critical Period

Chairman of N. Y. Commission considers development of competing carriers

Transportation companies, particularly railroads and street railways, are passing through a very trying period, says Milo R. Maltbie, chairman of the New York State Public Service Commission, in a recent statement discussing "Trend in Transportation." The statement considers obsolescence of transport agencies, rate bases and the development of highway competitors of railways. Rail carriers, Mr. Maltbie points out, "In addition to the necessity of meeting competition from new forms of transport, must face the troubles which the present business crisis imposes upon them; even without the latter, the present would be critical."

The statement continues, by references to the obsolescence of transport agencies of the past, to stress the necessity for adequate depreciation reserves, holding that it is as necessary in the utility as in the banking field to eliminate the reckless promoter. "The speculator and the promoter," Mr. Maltbie says, "demand high rewards; they are not content with an investment return. Hence, any utility that is in their hands must have high rates and sometimes poor service."

The railways are criticized in the statement for adhering to the theory of valuation on a cost of reproduction basis since it is held that if rates were made on this basis the carriers would "sit in sackcloth and ashes." Passenger traffic declined, Mr. Maltbie says, when "many found it was actually cheaper, others thought so, to use their own cars or buses than to pay 3.6 cents per mile..... One may talk about the greater convenience and better service of the railroad car and the Pullman but as long as persons are satisfied to use buses at lower rates or to drive their own cars, arguments are futile."

"Only recently," he continues, "has there been any direct and serious attempt to induce the public to return to the railroads. Certain railroads have announced fares of two cents per mile. Experience alone will tell what the net effect will be. Undoubtedly, it will increase traffic; but it is also certain that if the rate of two cents had been charged before auto transportation had obtained such a foothold, less traffic would have left the railroads.

(Continued on page 473)

"That was some great economy in getting the railroads to lower their rates and then a few politicians take the credit for it. Now, if the bus men had been as patriotic and as liberal there might be some room for generous applause. But they didn't—no more than anybody else — except the roads that are the largest taxpayers in Mason county and every other county through which their rails pass. And when the matter is all boiled down, the roads will get no particular credit for what they have done and are doing. Here is one editor who thinks the railroads got a dirty deal in this drought relief matter, and they deserve practically all the credit for doing something of real help to those in need. The bouquet that will be given them, however, will be when some one-gallus statesman from up the creek introduces a measure to increase their taxes, as is usual at all sessions of legislatures."

—From the Daily Independent of Maysville, Ky.

I. C. C. Appropriation

Both the House and the Senate have adopted the conference report on the independent offices appropriation bill, which includes an appropriation of $9,475,593 for the Interstate Commerce Commission including $3,583,588 for valuation.

Class Rates Postponed

The general revisions of freight rates prescribed by the Interstate Commerce Commission for eastern and western trunk line territories will not become effective until June 15, the railroads being unable to complete the revisions in time to make them effective sooner. Arrangements have been made with the carriers by which they will give 45 days' notice in their tariffs, in order to give interested parties sufficient opportunity to examine the readjustments before they become effective. The commission had estimated that the western revision would increase the revenues of the roads by $10,000,000 to $12,000,000 a year and that the eastern revision would increase revenues $20,000,000 to $25,000,000; but the western roads insist that the effect will be less and the eastern roads have asserted that the prescribed rates would reduce their revenues.

I. C. C. Investigation Favorably Reported

Senate and House committees recommend study of railroad competitors

Although it has been difficult in recent years to fix the attention of Congress on proposed railroad legislation for long enough to produce much result in the way of laws, it is nearly always ready enough to order an investigation. Both the Senate and the House committees on interstate commerce have favorably reported the Fess-Parker resolution to direct the Interstate Commerce Commission to conduct an investigation and study of the various agencies of transportation operating in competition with the railroads and the effect of such competition, and to report its recommendations in December as to whether any of them should be regulated, or further regulated, and whether existing governmental regulation of interstate commerce should be modified or amended. The Senate committee's favorable report was made on February 21 and the House committee ordered a favorable report on February 24. The House committee amended the resolution to omit the requirement of a report as to the effect of competition of other transportation "on railroad revenues" and to insert in place of it a direction to report conclusions "as to the effect of existing or potential competition between motor, water, air, pipe line and railroad agencies of transportation."

"Reciprocity" Hearings to be Resumed

The Interstate Commerce Commission has assigned its investigation of reciprocity in the matter of purchasing and routing for further hearing at Brooklyn, N. Y., on March 11, before Examiner J. L. Rogers, when testimony pertaining to the New York Central will be received.

Safety Program for March

L. G. Bentley, chairman of the Committee on Education, Safety Section, A. R. A., has issued circular No. 292 proposing that for the month of March safety committees pay special attention to the record which shows 6,036 employees injured on American railroads in one year in handling rails, ties, bridge timber, etc. The burden of his argument is "The Tale of a Tie"; a three-page allegory with a half dozen pictures inserted to show how men injure themselves by letting timbers fall on their

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INTENSIFIED POWER PRODUCTION

. . . Cuts Locomotive Maintenance

■ Locomotive maintenance has been shown to be proportional to the number of cylinders and drivers.

■ So when the Lima-built 2-10-4 type locomotives of the Chesapeake and Ohio Railway replaced Mallets, a substantial maintenance saving was accomplished, as well as an improvement in operation.

■ The 2-10-4's have only two cylinders and five pairs of driving wheels to be maintained as compared with four cylinders and eight pairs of driving wheels on the Mallets.

LIMA LOCOMOTIVE WORKS INCORPORATED

LIMA LOCOMOTIVE WORKS

INCORPORATED

LIMA - - - - - - - - - OHIO

feet, and similar kinds of carelessness. Personified as a very alert human inspector and condemning various kinds of carelessness, the tie, endowed with the power of speech, imparts numerous salutary lessons; and his observations end up in the following summary: "If I was the Big Boss, I wouldn't stand for it. I wouldn't have a man who would take chances—and the first man I'd tackle would be the one that took a chance and didn't have an accident. See the point? I'd cure 'em before they got hurt. . . ."

Reconsideration of Western Grain Case Asked

The western railroads have again petitioned the Interstate Commerce Commission to vacate or postpone the effective date of its order prescribing a general revision of grain rates in the western district and for export, which they say would reduce their revenues by over $20,000,000 a year. Under present orders the rates would become effective on April 1. The roads' request is based on the ground that the record supporting the order was closed on September 22, 1928, and that the changes in their financial condition during the past year have created additional reasons for reconsideration.

Asserting that in the eleven years since the Transportation Act was passed they have never been allowed rates sufficient to produce the fair return contemplated by that act the roads say that the grain rate reductions will far more than offset what increases in revenues may be derived from the increase in western trunk line class rates, although in the class rate case the commission held that their revenues were inadequate, and that their aggregate revenues were 14.35 per cent less in 1930 than in 1929. It is pointed out that in the 1920 rate advance case the commission found that the tentative value for rate-making purposes for the western district was $8,100,000,000 and that since then $2,220,808,000 has been added through additions and betterments. A return of 5¾ per cent on the total would be $593,446,510, whereas the largest net the western roads have ever earned, (that in 1929) was $90,564,187 less than that sum; and their 1930 net was fully $200,000,000 less than that amount.

The tariff-publishing agents of the western roads have also applied for a postponement from April 1 to June 1 of the effective date of the order on the ground that it is physically impossible to complete the tariff changes in the time allowed. They say the mere printing would take 18 days.

B. & M. Clerks Attack Unregulated Competition

In line with action taken within the past few months by employees of other railroads, and particularly by members of their own union, the clerks employed by the Boston & Maine have recently adopted resolutions calling for "proper regulation and supervision" of motor vehicles and other transportation agencies competitive with railroads. These resolutions, which contemplate an organized campaign of assistance to railroad management in meeting such competition, are published below:

Be it therefore resolved: That the Boston & Maine System Board of Adjustment of the Brotherhood of Railway and Steamship Clerks, Freight Handlers, Express and Station Employees enlist the co-operation of all its system Lodges in an organized campaign, political and otherwise, for the purpose of bringing before the public the vital necessity for proper regulation and supervision of motor vehicles engaged in the business of carrying passengers and freight for hire.

1. By familiarizing ourselves with the nature of all bills pending before Congress favorable to such regulation, and using our influence as a body, and, where necessary, the individual influence of every member of our organization, to secure the passage of such legislation.

2. By using our influence in the same manner to secure legislation necessary to place competitors under the same regulatory rate body, thus assuring that no unfair competition be permissible.

3. By insisting upon legislation regulating the hours of labor and rates of pay of employees of competitor organizations.

4. By suggesting, wherever possible, new legislation to better both the positions of the railroads and ourselves in respect to this issue.

5. By appointing committees in each district to watch the press and censor the utterances of public speakers, bringing to their attention by letter or otherwise any points which appear detrimental either to the railroads or their employees, pointing out wherein we differ and requesting, in fact, insisting, wherever possible, by means of our united strength, that some public retraction be made.

5a. That with the aid of these committees, a file be maintained at headquarters in which such facts may be tabulated and held ready for use when necessary, the information to be sent on a standardized form suitable for filing under various headings in headquarters staff.

5b. That each local committee hold meetings frequently and bring matters of interest to the attention of the general chairman.

6. By evolving some scheme whereby we may obtain some reliable information of truck and bus activities in the various communities on the Boston & Maine Railroad through the local committee.

7. By placing any information obtained at the disposal of the management at the discretion of our general chairman.

8. By seeing that every committee and every employee do their part in this campaign and realizing that the good of the railroad is our good, and that if railroad capital gets out of work railroad employees get out of work also.

9. By insisting that the government, if they must compete with the railroads by water lines, compete on a fair basis, *i.e.*, charge the same rates as the railroads do, and if such water lines operate at a loss, discontinue them, and not make the tax payers, including the railroads who suffer from the competition, pay the losses in increased taxes.

10. By every fair means within our power to use our influence to eliminate unfair competition from the railroads.

Shopmen Given Opportunity To Read Railway Age

Copies of the *Railway Age*, an authoritative weekly journal devoted to rail transportation in all its phases, received by the various works units, have now been made available to mechanics as well as supervisors at Altoona.

At Altoona machine shop, ten copies of this publication will be distributed one each to the air brake shop, machine shop No. 1, machine shop No 2, erecting shop No. 2, erecting shop No. 3, boiler shop, wheel shop, truck and frame shop, manufacturing shop and M. P. labor depts. In order that employes in all departments may be taken care of, bolt shop employes are included, in the circulating arrangement, with those of machine shop No. 2; miscellaneous and smith department employes with wheel shop; tin shop with truck and frame shop, and electrical shop with manufacturing shop. Erecting shop No. 3 copy will be available also to cab and paint shop employes and to boiler-erecting shop men working in E. S. 3; and copies in E. S. No. 2 and boiler shop will be accessible to boiler-erecting shop employes working in E. S. 2 and old flue shop, respectively. Requests for use of the periodical should be made by the employe on his foreman.

The *Railway Age* may be read by Juniata shop men from any department in the welfare building east of erecting-machine dept. Five copies of the weekly are available for the purpose, and may be had on application to C. C. Gorsuch, janitor, E. & M. shop. A copy each of the monthly trade journals, "Mill and Factory" and "Compressed Air," may be obtained in like fashion.

Altoona car shop's six copies of *Railway Age* are routed through the various shops, each copy serving two or three depts. Foremen of labor dept., smith shop, buffing shop, steel shop, carpenter shop and freight shop each have final custody of one copy. Employes may get the use of the publication by applying at the nearest custodian office.

The five copies of *Railway Age* received by South Altoona foundry may be borrowed from either the foreman of the iron foundry, foreman of core dept., foreman of pattern shop, foreman of spring shop or foreman of power plant.—From the Pennsylvania News.

Rail-and-Barge Rates Postponed

The Interstate Commerce Commission has postponed from March 16 to June 15 the effective date of its order of last July in which it required the establishment of through routes and joint rates via the Mississippi Valley Barge Line between points in central territory and points in southern and southwestern territory. The postponement does not apply, however, to rates on wrought iron pipe, which are to be established by March 16.

Milwaukee Train Changes

The Chicago, Milwaukee, St. Paul & Pacific has reduced the running time of its passenger train, "The Sioux," between Chicago and Sioux Falls, Iowa, and Rapid City, S. D., 1 hr. 15 min. The train now leaves Chicago at 5 p.m. instead of 6:15 p.m. and arrives in Sioux Falls at 8:45 a.m. and Rapid City at 12:25 a.m. as formerly. Returning it leaves Rapid City at 11:30 p.m. instead of 10:30 p.m. and Sioux Falls at 4 p.m. as formerly and arrives in Chicago at 8 a.m. as formerly.

Private Car Order Sustained

The Supreme Court of the United States in a decision rendered on February 25 sustained the order of the Interstate Commerce Commission prohibiting the transportation by one carrier of the private or business cars of another free or at less than published tariff rates. The railroads had appealed to the Supreme Court from a decision of the district court for the western district of Kentucky and from another of the district court for the western district of Missouri.

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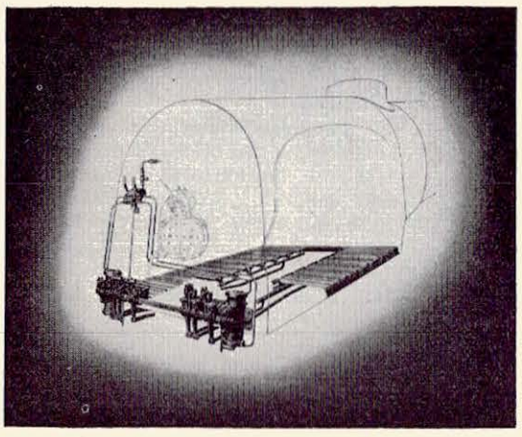
FRANKLIN
STEAM GRATE SHAKER
for better fires on your long runs



FRANKLIN Steam Grate Shaker was created to reduce turn-around time and save fuel. It keeps fires clean and helps the engine successfully negotiate long runs extending over two or three divisions.

■ With the improved Franklin Steam Grate Shaker, the grate bars follow the motion of the valve operating hand lever like the action of a power Reverse Gear.

■ The big single cylinder has ample power to handle several sections of the grate at one time.

■ A full stroke can be obtained even after the parts between the piston and cross shaft have become worn.

■ Steam cushioning reduces shocks and wear.

■ With this improved device, the grates may be shaken vigorously or they may be just gently stirred without danger of dumping the fire while running.

■ Apply the Steam Grate Shaker on every locomotive used regardless of length of runs. Even at terminals it saves time, money and fuel.

FRANKLIN RAILWAY SUPPLY COMPANY,
INCORPORATED

NEW YORK ST. LOUIS CHICAGO
SAN FRANCISCO MONTREAL

The court said that the history of the interstate commerce act shows clearly that the evil of discrimination was the principal thing aimed at and that there is nothing in the nature of railway equipment which justifies its transportation without charge except when it is being handled for revenue purposes in the interest of the carrier performing the service. It was held that the commission's order was within its authority and that it had power to revise its regulations as to passes.

Waterways Corporation Extends Operations

The Interstate Commerce Commission, on February 26, issued a certificate authorizing the Inland Waterways Corporation to extend its operations to the Illinois river.

D. & R. G. W. Bars Married Women in Clerical Positions

The Denver & Rio Grande Western has reached an agreement with the Brotherhood of Railway Clerks under which married women will not be employed in clerical positions on that railroad. The action was taken for economic reasons to provide a greater number of positions for married men.

Open Draw; Four Killed

Northbound express train No. 98 of the Louisville & Nashville, the Pan-American, was derailed on Wednesday, February 25, about 1 a. m., 18 miles north of Mobile, Ala., by running into an open draw at the Mobile River. The engineman, fireman, baggageman and one porter were killed. The latter two were in the leading car. The next car, a sleeper, occupied by 18 passengers, was stopped when half way over the end of the fixed span.

Railway Offices in New York

The Southern, the Chicago, Burlington & Quincy, and the Great Western of Great Britain have engaged office space in the new 60-story building which has just been opened at the northwest corner of Fifth avenue and 42nd street, New York City, the "500 Fifth Avenue Building." All three are to be located on the fourth floor. The Hutchins Car Roofing Company, Detroit, has leased space on the seventeenth floor. The new building is about 80 rods west of the Grand Central Terminal.

Research Graduate Assistantships

Nominations to the fourteen research graduate assistantships at the Engineering Experiment Station, University of Illinois, Urbana, Ill., will be made this year as usual from applications received by the director of the station not later than April 1. These assistantships, for each of which there is an annual stipend of $600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved American and foreign universities and technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry. An appointment to the position of research graduate assistant is made and must be accepted for two consecutive collegiate years of ten months each, at the expiration of which period, if all requirements have been met, the degree of Master of Science is conferred. Additional information concerning these assistantships may be obtained by writing the director of the station at Urbana.

Farming on the Central of Georgia

The Agricultural Department of the Central of Georgia has now been in operation for 20 years, constantly working for the improvement of agricultural conditions in the counties through which the road operates in Georgia and Alabama; and the anniversary is celebrated by the publication of "Agricultural News," a 25-page pamphlet. The subject of most of the articles in the magazine is some phase of winter farming. J. F. Jackson, general agricultural agent, (Savannah) is aided by three district agents. Copies of the magazine will be sent free to all applicants.

C. & N. W. and Burlington Reduce Train Times

The Chicago & North Western has reduced the running time of its North Western Limited 1 hr. 45 min. between the Twin Cities and Chicago, thus placing the train on a 10 hr. 10 min. schedule. The north-bound schedule has not been changed, the time being 10 hr. 55 min. The train now leaves St. Paul at 9:35 p.m. instead of 8:40 p.m. and arrives in Chicago at 7:45 a.m. instead of 8:35 a.m.

The Chicago, Burlington & Quincy has reduced the time of the Black Hawk between St. Paul and Chicago 35 min., thus placing the train on an 11 hr. schedule. The train now leaves St. Paul at 9:10 p.m. instead of 8:45 p.m. and arrives in Chicago at 8:10 as formerly.

Safety on the Santa Fe

Isaiah Hale, superintendent of Safety of the Atchison, Topeka & Santa Fe, reported on Friday, February 6, that no employee had been killed while on duty for eighty-five days; a remarkable fact, attributable in great measure to the work of the safety committees. This statement applies to the whole Santa Fe system; over 13,000 miles of road, operating nearly 2000 locomotives and employing around 60,000 men. Calculating by the law of averages it is estimated that if conditions today were no better than those existing prior to the organization of the Safety department, in 1912, no less than 33 employees would have been fatally injured in this period of 85 days. Not for many years had it been possible to record a single calendar month without a fatality.

Railway Subsidiaries Denied N. J. Highway Routes

The Pennsylvania General Transit Company, highway subsidiary of the Pennsylvania, and the Reading Transportation Company, highway subsidiary of the Reading, were recently denied the approval of municipal consents which they had obtained for the operation of motor coaches between Philadelphia, Pa., Camden and Wildwood, N. J. The petition of a third applicant, Shore Service, Inc., for the same route, was also denied in the same order of the Board of Public Utility Commissioners of New Jersey. The board held that communities along the proposed route are at present adequately supplied with highway service.

The application of the Pennsylvania proposed the installation of 20 buses on the route while the Reading Transportation Company applied for permission to operate 15 vehicles.

The Central Vermont as a "Bridge"

Seventy per cent of the traffic moved by the Central Vermont originates on some other line, and is destined to some point beyond the Central Vermont, J. B. Wood, treasurer of the road, revealed in an address at Barre, Vt., on February 18. The speaker stressed the advantage to Vermont of having the railroad's officers and employees as residents of the state, pointing out that in order to hold the highly competitive traffic which fills its trains, the road must maintain a first-class road bed and highly efficient service. This policy results in large expenditures within the state.

Speaking on his general topic of the railroad situation and the exigencies of competition, Mr. Wood reminded his hearers that among the heavy expenditures that a railroad must make in these days, are large sums for the elimination of grade crossings "to enable the road's competitors—the buses and trucks on the highway—to avoid making stops at grade crossings and thus to improve their service and reduce their expenses."

Seek Appeal on Montreal Track Elevation

Permission to appeal to the Supreme Court of Canada an order on the Board of Railway Commissioners which enabled the Canadian National to construct an elevated track in the northern district of Montreal, was sought last week in an application heard by Justice Rinfret. Judgment was reserved.

The Railway Board a short time ago issued an order by which the C.N.R. would be able to construct an elevated track from Longue Pointe to eastern junction in the northern section of the city of Montreal. The city, together with the Bell Telephone Company of Canada and the Montreal Light, Heat and Power Company today sought leave to appeal this ruling to the Supreme Court. The telephone company and the power company were interested because the Railway Board's order would compel them to remove their wires and cables from the right-of-way.

Hearing on Parcel Post Rate Revision

Testimony of representatives of the Postoffice Department in support of its application for the consent of the Interstate Commerce Commission for a revision

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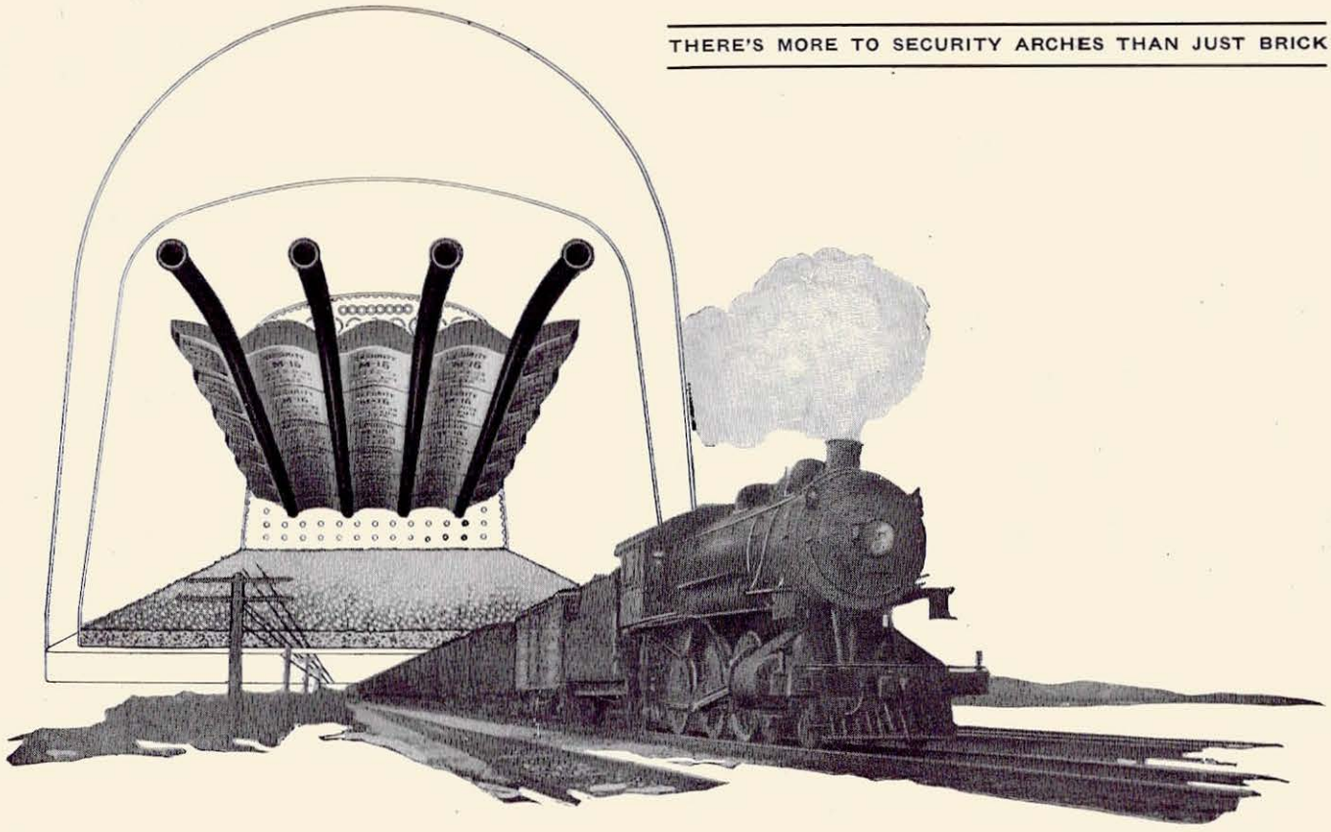
THERE'S MORE TO SECURITY ARCHES THAN JUST BRICK



EXPERIENCE . . .
the keystone of ARCH service

- SITTING up with ailing engines, riding them in all kinds of weather, studying combustion conditions and doing this for 21 years has given American Arch Company a unique background of experience.
- This experience is the keystone of Arch Brick service.
- The locomotive Arch is an engineering specialty. Its performance is affected by a variety of conditions. Only by knowing intimately, through years of experience, the things that affect the Arch can the proper service be secured.
- Only American Arch Company is equipped with this background of experience. The result is better service from locomotive Arches.

Harbison-Walker Refractories Co.
Refractory Specialists

American Arch Co.
INCORPORATED
Locomotive Combustion Specialists

of parcel post rates, including increases in the rates for the shorter hauls and reductions in the rates for longer hauls, was heard by Commissioner Tate and Examiner Mullen at Washington on February 19, after which an adjournment was taken to allow time for the various protestants to examine the statistical data presented. These include the Railway Express Agency and J. C. Wise, special assistant to the Attorney General for the Postoffice Department.

The department estimates that its reductions in the rates for longer hauls and on the larger packages, and especially the proposal to increase the size and weight limits for packages, will develop new business for the department and increase its revenues by several million dollars a year. President Hoover has announced his intention of appointing a commission to inquire into possible sources of increased revenue for the department, to reduce its deficits.

A.R.E.A. Convention Program

Final details of the thirty-second annual convention of the American Railway Engineering Association have been virtually completed. The meeting will be held at the Palmer House, Chicago, as in the recent past, but will extend for two days only, March 10 and 11. The program follows:

TUESDAY MORNING

President's address, G. D. Brooke, vice-president and general manager, Chesapeake & Ohio
Reports of secretary and treasurer
Reports of committees on:
- Standardization
- Stresses in Railroad Track
- Uniform General Contract Forms
- Clearances
- Electricity

TUESDAY AFTERNOON

- Grade Crossings
- Ballast
- Ties
- Wood Preservation
- Iron and Steel Structures
- Wooden Bridges and Trestles
- Maintenance of Way Work Equipment

TUESDAY EVENING

- Yards and Terminals
- Shops and Locomotive Terminals
- Buildings
- Roadway

WEDNESDAY MORNING

Reports of committees on:
- Signals and Interlocking
- Rules and Organization
- Records and Accounts
- Masonry
- Rivers and Harbors
- Economics of Railway Location
- Economics of Railway Labor

WEDNESDAY AFTERNOON

- Water Service and Sanitation
- Rail
- Track
- Economics of Railway Operation

As a part of the report of the Roadway committee, Dr. G. E. Ladd, consulting engineer geologist, Washington, D. C., will give an illustrated talk on drainage.

Roads Oppose Barge Line Extension

Opposition to the application of the Inland Waterways Corporation for a certificate authorizing it to extend the operation of the federal barge line to the Illinois river was expressed on behalf of the Central Freight Association and the Trunk Line Association lines in a statement filed with the Interstate Commerce Commission by Eugene Morris. He said that neither the present nor the future public convenience and necessity require the operation of the barge lines on the Illinois and that if through routes and joint rates are established, as requested, the result will be wasteful transportation without benefit to the public but with distinct disadvantage to the railroads. Pointing out that the avowed purpose of the government in operating barge lines is to demonstrate the practicability with a view to inducing private corporations to engage in such service, Mr. Morris said that the territory now served by the barge lines is sufficient for such a demonstration and that the territory that would be served by the proposed extension is already amply served by railroads.

Club Meetings

The Car Foremen's Association of Chicago will hold its next meeting at the Great Northern Hotel, Chicago, on Monday evening, March 9. The discussion will be on the proposed changes in the Interchange Rules for 1932.

The Canadian Railway Club will hold its next meeting on Monday evening, March 9, at the Windsor Hotel, Montreal. J. D. Cameron, district superintendent of colonization of the Canadian Pacific (Toronto) will speak on the attitude of the railways toward immigration and colonization. Motion pictures will be shown at 7:30 o'clock.

The Central Railway Club of Buffalo will hold its next meeting at Hotel Statler, Buffalo, on Thursday evening, March 12. "The story of Anaconda" provided by the Anaconda Copper & Cable Company, will be the subject of the evening, illustrated by motion pictures. The headquarters of the Central Railway Club will henceforth be at Hotel Statler, Room 1817. The president of the club is C. H. Youst, terminal trainmaster of the D., L. & W., at East Buffalo.

The New York Railroad Club will hold its next meeting on Friday evening, March 20, at the Engineering Societies Building, 29 West 39th street, New York. This will be "electrical night," under the auspices of the Westinghouse Electric & Manufacturing Company.

The Car Foreman's Association of Omaha, etc., will hold its next meeting at Council Bluffs, Ia., on Thursday, March 12, at 2 p. m. E. R. Phillips (C. & N. W.) will present a paper on standard marking on wheels removed at shops. There will also be a discussion of freight car brake rigging.

The Car Foremen's Association of St. Louis will hold its next meeting on Tuesday evening, March 3, at the American Hotel Annex. M. E. Fitzgerald (C. & E. I.) will present a paper on the A. R. A. loading rules.

The Indianapolis Car Inspection Association will hold its next meeting at Hotel Severin, Indianapolis, on Monday evening, March 2. J. C. Stewart will present a paper on inspection and interchange of cars.

The Pacific Railway Club will hold its fourteenth annual meeting and banquet at Fairmont Hotel, San Francisco, Cal., on March 19. The principal speaker will be S. T. Bledsoe, chairman of the Executive Committee of the Atchison, Topeka & Santa Fe. Frank E. Russell, mechanical engineer of the Pacific Lines, Southern Pacific Company, will be installed as president of the club for the ensuing year.

Rail-Bus Fight Grows Sharper

"Tennessee today has become the battle ground of what may be a national transportation struggle involving the bus lines, the state and the railroads," says a recent United Press dispatch from Knoxville, Tenn., to the Nashville Banner.

"The most active participants are the freight buses, seeking to use the highways for transportation purposes, and the state determined to keep bus freight loads to a minimum that will not destroy the roads." The item continues. "The railroads are carrying on a newspaper advertising campaign designed to force the competing bus operators to pay more taxes.

"One of the first skirmishes in the fight took place here when Servals Evrard, division patrol chief, required a truck and two trailers of the Goodrich Tire Company, Akron, Ohio, enroute from Silvertown, Ga., to reduce their load of tire fabric to the maximum under the state law. He also insisted the drivers obtain Tennessee licenses.

"The drivers, presumably to avoid the purchase of license plates and to comply with Evrard's insistence to reduce their loads, turned their cargoes over to the Southern Railway to be shipped to Akron and proceeded with empty buses.

"Thus the railroads won two ways:

"They saw the buses compelled to observe state laws on loads. They got the benefit of the freight shipment.

"Tennessee law forbids any one motor vehicle to carry more than ten tons gross load, which includes the weight of the vehicle itself, but it goes further and says the maximum weight on any wheel shall not exceed 650 lb. per in. width of tire tread in contact with the road surface. The second requirement must be observed even though the gross load is under ten tons. This is to keep the tread wide enough to distribute the shock of the load on a greater surface, Evrard pointed out.

"The patrol force does not accept the factory specification for the loads based on the amount of air in the tires. It tests the distribution of the load on the highway surface by 'weighing' each wheel and 'fingerprinting' the tire.

"Evrard pointed out that a wheel, carrying a load of 11,960 lb., such as the one mentioned above, strikes a tremendous blow when it hits a hole in the road of even a few inches. Hundreds of trucks are rolling through Knoxville and the blows they pound can scarcely be computed, Evrard pointed out.

"The state is going to enforce the law, both as to loads and the requirement that buses transporting goods through Tennessee must carry Tennessee licenses. And the railroads will do their share to combat bus and truck transportation."

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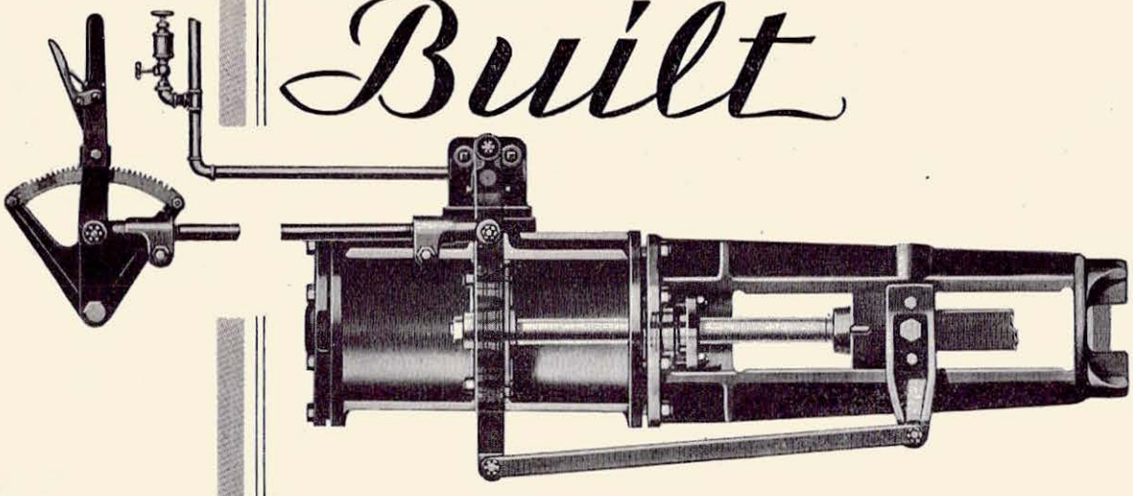
Alco Built



REVERSE gears are rapidly becoming recognized as essential equipment. But the growing demand for the Alco Reverse Gear in particular goes farther back than that.

To measure up to the needs of today for a fast, flexible and dependable gear for any service is the central idea around which Alco reverse gears are built. It serves acceptably in heavy freight service and responds equally well to the needs of high speed passenger requirements. Again, in fast freight, helper and switching service it gives quick and accurate valve gear adjustment.

With low initial cost, its simple and interchangeable construction eliminates expensive repair parts throughout a long service life.

In short, that extra measure of service which is inbuilt in every Alco product is fully embodied in Alco Reverse Gears.

American Locomotive Company
30 Church Street New York N. Y.

Bremner Talks on Subsidies

As a result of railroad land grants—the sale of government land to the railroads for $1.25 an acre—the railroads must give the government reduced rates which in an average year save the government $5,000,000, acording to W. H. Bremner, receiver of the Minneapolis & St. Louis in an address before a meeting of the Northwest Shippers' Advisory Board at St. Paul, Minn., on January 27. It has been said that the railroads have no right to complain of the subsidizing of water and bus transportation because they were themselves subsidized. "Sure we were," says Mr. Bremner, "beautifully subsidized. The government gave us—back in the days when it was offering land at $1.25 an acre out in this great west, and no buyers—land which at that price was worth approximately $125,000,000. But the grant was not unconditional. Every land-grant railroad, as a consideration for the grant, entered into a contract with the government to haul government freight and troops, and the United States mail, at rates varying from 50 to 80 per cent of the regular rates.

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Operating Revenues and Operating Expenses of Class I Steam Railways in the United States

Compiled from the Monthly Reports of Revenues and Expenses for 171 Steam Railways, Including 16 Switching and Terminal Companies.

FOR THE MONTH OF DECEMBER, 1930 AND 1929

Item	United States		Eastern District		Southern District		Western District	
	1930	1929	1930	1929	1930	1929	1930	1929
Average number of miles operated	242,767.76	242,780.98	60,316.37	60,220.79	46,105.66	46,149.39	136,345.73	136,410.80
Revenues:								
Freight	$280,908,835	$341,226,867	$118,583,813	$146,707,140	$55,249,850	$65,844,433	$107,075,172	$128,675,294
Passenger	a 55,442,513	b 74,478,308	30,791,627	39,925,313	7,259,028	10,772,953	17,391,858	23,780,042
Mail	11,315,813	c 15,806,434	4,272,907	6,499,772	1,748,030	2,092,072	5,294,876	7,214,590
Express	9,126,704	12,052,132	3,852,102	4,803,622	1,538,267	2,069,772	3,736,335	5,178,738
All other transportation	12,304,464	15,148,427	6,903,800	8,451,557	1,121,473	1,355,659	4,279,191	5,341,211
Incidental	8,043,658	9,832,271	4,402,408	5,044,229	1,041,082	1,437,911	2,600,168	3,350,131
Joint facility—Cr.	1,092,150	1,197,172	417,823	356,134	163,783	199,235	510,544	641,803
Joint facility—Dr.	301,326	346,116	79,588	91,231	24,146	41,294	197,592	213,591
Railway operating revenues	377,932,811	469,395,495	169,144,892	211,696,536	68,097,367	83,730,741	140,690,552	173,968,218
Expenses:								
Maintenance of way and structures	43,756,889	60,290,441	18,881,217	26,597,048	7,540,278	10,510,947	17,335,394	23,182,446
Maintenance of equipment	81,135,945	98,448,069	g 40,444,985	46,160,098	13,091,712	17,479,698	27,599,248	34,808,273
Traffic	9,951,116	11,170,579	3,757,053	4,265,707	1,807,095	2,078,363	4,386,968	4,826,509
Transportation	144,291,494	173,575,546	68,084,302	83,226,222	23,314,638	26,426,543	52,892,554	63,922,781
Miscellaneous operations	3,958,674	4,866,320	1,935,099	2,354,759	453,828	528,841	1,569,747	1,982,720
General	15,927,589	17,155,816	6,956,059	7,648,393	2,722,359	2,815,533	6,249,171	6,691,890
Transportation for investment—Cr.	1,415,556	1,845,222	328,836	468,142	223,544	302,764	863,176	1,074,316
Railway operating expenses	297,606,151	363,661,549	139,729,879	169,784,085	48,706,366	59,537,161	109,169,906	134,340,303
Net revenue from railway operations	80,326,660	105,733,946	29,415,013	41,912,451	19,391,001	24,193,580	31,520,646	39,627,915
Railway tax accruals	20,423,780	24,323,484	7,740,923	9,114,150	3,780,879	5,404,709	8,901,978	9,804,625
Uncollectible ry. revenues	193,609	109,631	108,706	d 24,051	29,643	73,825	55,260	59,857
Railway operating income	59,709,271	81,300,831	21,565,384	32,822,352	15,580,479	18,715,046	22,563,408	29,763,433
Equipment rents—Dr. balance	7,686,815	7,486,895	4,039,545	4,309,457	182,245	d 295,032	3,465,025	3,472,470
Joint facility rent—Dr. balance	2,650,689	1,921,761	1,738,736	1,016,762	207,798	106,609	704,155	798,390
Net railway operating income	49,371,767	71,892,175	15,787,103	27,496,133	15,190,436	18,903,469	18,394,228	25,492,573
Ratio of expenses to revenues (per cent)	78.75	77.47	82.61	80.20	71.52	71.11	77.60	77.22

FOR TWELVE MONTHS ENDED WITH DECEMBER, 1930 AND 1929

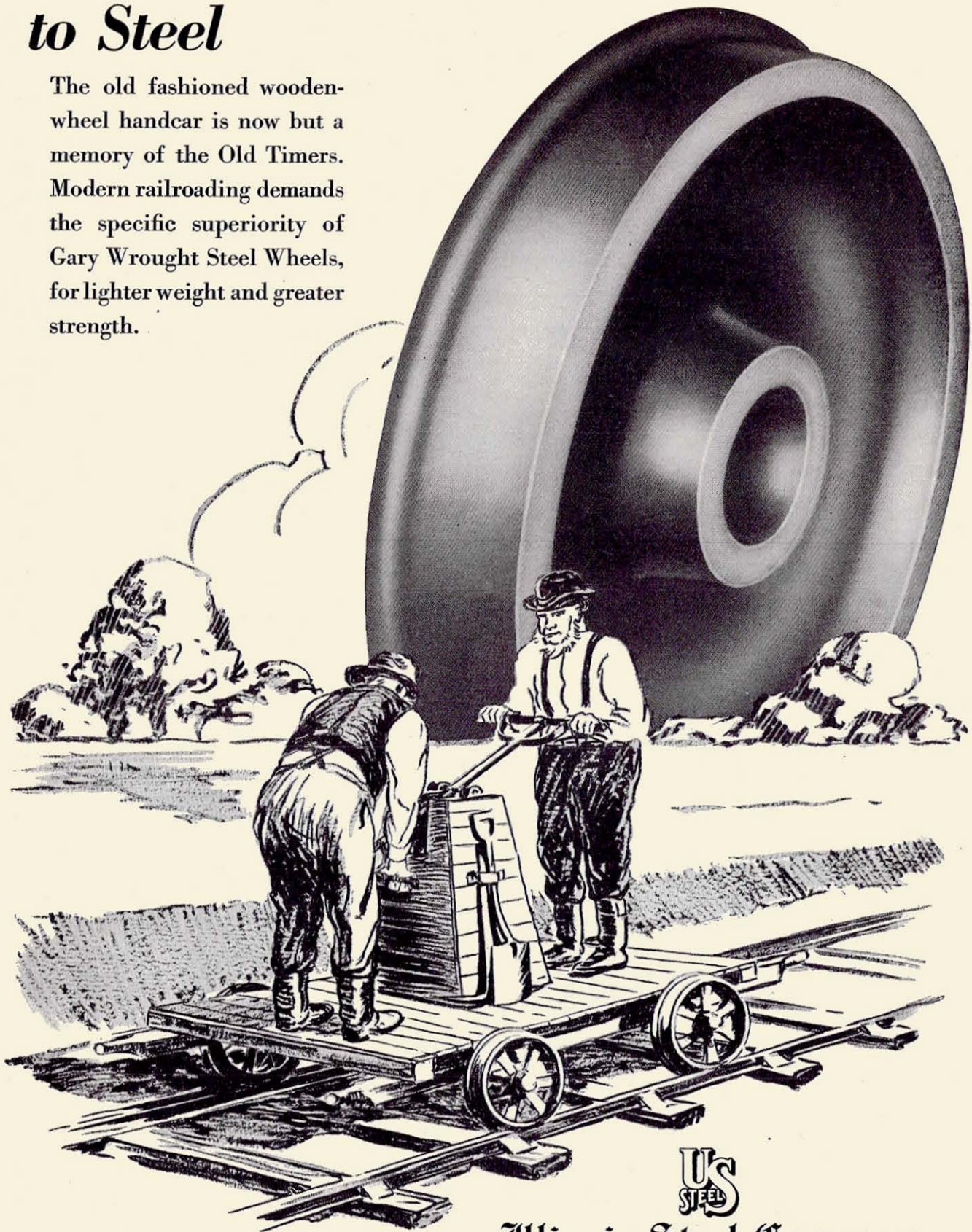
Average number of miles operated	242,707.70	242,719.99	60,309.56	60,212.10	46,127.64	46,138.76	136,270.50	136,369.13
Revenues:								
Freight	$4,085,801,090	$4,832,324,826	$1,731,149,479	$2,082,450,909	$749,218,071	$869,403,934	$1,605,433,540	$1,880,469,983
Passenger	e 729,635,768	f 874,036,318	404,123,150	467,354,315	94,079,166	119,461,191	231,433,452	287,220,812
Mail	111,460,210	g 151,572,880	42,576,031	61,806,060	18,499,651	23,105,823	50,384,528	66,660,997
Express	114,668,664	148,249,350	51,399,803	67,895,748	16,919,945	22,620,702	46,348,916	57,732,900
All other transportation	175,202,388	209,944,446	101,349,513	120,776,865	13,179,512	15,937,937	60,673,363	73,229,644
Incidental	116,514,497	134,340,030	60,768,221	67,468,903	15,089,697	16,948,085	40,656,579	49,923,042
Joint facility—Cr.	13,341,066	13,740,449	4,559,745	4,443,156	2,335,039	2,228,243	6,446,282	7,069,050
Joint facility—Dr.	3,666,637	3,904,524	1,093,903	990,153	391,907	432,762	2,180,827	2,481,609
Railway operating revenues	5,342,957,046	6,360,303,775	2,394,832,039	2,871,205,803	908,929,174	1,069,273,153	2,039,195,833	2,419,824,819
Expenses:								
Maintenance of way and structures	713,012,582	864,704,630	303,156,463	362,264,364	124,146,845	151,571,667	285,709,274	350,868,599
Maintenance of equipment	1,027,042,042	1,212,411,919	479,372,424	573,871,326	182,020,059	215,647,769	365,649,559	422,892,824
Traffic	128,167,397	130,570,306	49,077,456	49,847,807	23,675,485	23,936,392	55,414,456	56,786,107
Transportation	1,874,853,725	2,112,743,907	881,531,934	998,137,307	299,914,963	332,915,127	693,406,828	781,691,473
Miscellaneous operations	52,607,332	58,936,590	24,788,826	27,223,563	6,052,099	6,429,320	21,766,407	25,283,707
General	193,324,421	196,179,762	84,579,716	85,253,190	32,787,493	33,370,905	75,957,212	77,555,667
Transportation for investment—Cr.	13,225,714	14,710,632	2,649,560	3,671,588	1,272,311	1,383,652	9,303,843	9,655,392
Railway operating expenses	3,975,781,785	4,560,836,482	1,819,857,259	2,092,925,969	667,324,633	762,487,528	1,488,599,893	1,705,422,985
Net revenue from railway operations	1,367,175,261	1,799,467,293	574,974,780	778,279,834	241,604,541	306,785,625	550,595,940	714,401,834
Railway tax accruals	353,685,697	402,943,185	144,935,564	167,212,643	65,813,651	74,437,632	142,936,482	161,292,910
Uncollectible ry. revenues	1,047,476	1,175,637	443,944	418,233	176,871	311,951	426,661	445,453
Railway operating income	1,012,442,088	1,395,348,471	429,595,272	610,648,958	175,614,019	232,036,042	407,232,797	552,663,471
Equipment rents—Dr. balance	99,368,515	95,569,421	49,823,703	48,515,381	822,182	d 2,724,319	48,722,630	49,778,359
Joint facility rent—Dr. balance	28,062,248	25,183,647	15,111,548	12,770,179	2,796,991	2,269,900	10,153,709	10,143,568
Net railway operating income	885,011,325	1,274,595,403	364,660,021	549,363,398	171,994,846	232,490,461	348,356,458	492,741,544
Ratio of expenses to revenues (per cent)	74.41	71.71	75.99	72.89	73.42	71.31	73.00	70.48

a Includes $2,503,231 sleeping and parlor car surcharge. b Includes $3,182,795 sleeping and parlor car surcharge. c Includes approximately $3,937,768 back mail pay. d Deficit or other reverse items. e Includes $35,233,287 sleeping and parlor car surcharge. f Includes $40,326,926 sleeping and parlor car surcharge. g Includes approximately $37,500,336 back mail pay.

Compiled by the bureau of statistics, Interstate Commerce Commission. Subject to Revision.

From Wood to Steel

The old fashioned wooden-wheel handcar is now but a memory of the Old Timers. Modern railroading demands the specific superiority of Gary Wrought Steel Wheels, for lighter weight and greater strength.



U S STEEL

Illinois Steel Company

Subsidiary of United States Steel Corporation

General Offices: 208 South La Salle Street, Chicago

"These contracts are without limit—that is, they run on and on so long as the railroads continue to exist. * * * And that is not all. In some cases, special conditions were imposed on particular railroads. For example, the Illinois Central received land estimated in value at approximately $3,500,000, and that road was required, in consideration therefor, to pay to the State of Illinois seven per cent of its gross revenues earned within that state so long as it should operate.

"Has anybody heard of any suggestion of paying back to the government any money which may be used in the development of the Mississippi channel by barge line companies that may operate over it? I doubt whether there ever will be anyone operating there except the government; but such a suggestion has never been made.

"But suppose that this whole $125,000,000 was a subsidy, suppose the government had given the railroads that amount. The investment today in railroad properties is approximately $26,000,000,000 and the difference between the $26,000,000,000 and the $125,000,000 represents private capital. Rather a small subsidy in comparison with the total investment."

Needed Revisions in the Transportation Act

Revision of ineffective provisions of the Transportation Act of 1920, was pointed out as necessary by W. B. Storey, president of the Atchison, Topeka & Santa Fe, at a meeting of the St. Louis (Mo.) Industrial Club on February 19.

Summarizing the chief objectives of the act as stabilization of labor, valuation to prevent over-capitalization, and consolidation, Mr. Storey briefly reviewed the results of the progress made by the railroads in the past 11 years as follows:

"Strikes are still possible, but the danger of frequent occurrence has been minimized. On the other hand the present law tends towards increases in wages. The valuation of the roads has not yet been completed and will accomplish little if it ever is completed. Consolidation has not been effected and the provision covering this should be changed so as to make it permissive when mergers are found by the Interstate Commerce Commission to be in the public interest.

"The credit of the roads was restored, not so much by having adequate income provided for them as by the hope that such adequate income could ultimately be attained. That credit is sure to disappear unless the public realizes that danger and insists on such changes in the present regulation as will permit the roads to earn proper returns."

G. A. Tank Car Corporation Expands

The General American Tank Car Corporation (headquarters, Chicago) has acquired from Swift & Company, meat packers, their entire equipment of stock, refrigerator and tank cars, about 6,000 cars altogether. The Swift establishment has operated its own car department since the organization of its packing business. The cars transferred will be continued in the service of Swift & Company under a long-term lease.

New Colorado Commissioners

Edward E. Wheeler, of Ouray, has been appointed a member of the Public Utilities Commission of Colorado for a term of six years. Dan S. Jones of Center, whose term had expired, has been reappointed for a period of four years. Mr. Wheeler succeeds Otto Bock, chairman of the commission, whose term had expired. Worth Allen of Greeley, at present a member of the commission, has been appointed chairman.

Maltbie Sees Railroads Facing Critical Period

(*Continued from page 468*)

"Railroads have been slow to realize the advantages of auto transportation to the public, viz., (1) the more frequent operation of units (buses every hour vs. several trains a day), (2) the deviation from prescribed routes when conditions warrant, (3) the greater convenience in the collection and delivery of persons and property at origin and destination points, and in many instances (4) lower charges.

"Railroads have persistently adhered to steam locomotion. Where traffic is light, the cost of operating a train consisting of an engine and one or two cars is very burdensome. Consequently on branch lines only one or two trains have been operated each way each day. The intervals are thus necessarily long, and the public finds the time schedule inconvenient and the cause of much delay. Railroad companies have been slow to realize the advantages of the gas or the gas-electric car, which can be operated more frequently and at less cost.

"The fixed roadway to which railroads must of necessity adhere is a great disadvantage in competing with bus routes. The former can be shifted to meet the demands of traffic only at large expense. Buses may be shifted to other routes with ease and facility, and as traffic changes entire routes may be changed. The convenience afforded in the collection and delivery of persons and property is a marked advantage and rated highly by the public.

"The railroads have been slow to supplement their lines with auto facilities. Had they realized its possibilities at an early date, they might have preserved a considerable part of the business taken from them. Legislation has been a bar in many cases, and has frequently lagged far behind the economic changes that have taken place."

While Mr. Maltbie next concedes that highway transportation in its present state brings competition which may be unfair to railroads, he nevertheless holds that "the railroads are not entirely blameless for the alacrity with which the public generally has been attracted by auto transportation. Probably nothing could have stopped its evolution when once the internal combustion engine was invented, but it is certain that the attitude of the railroads in demanding that their properties be valued upon the basis of reproduction cost less very little depreciation did not lead the public to great consideration of the needs of the railroads when auto transportation began to compete. The railroads insisted upon a return upon so-called value far in excess of the prudent, unimpaired investment. This they did not upon equitable grounds but upon legal, constitutional grounds, and naturally the public was not moved by sympathetic emotions to protect such constitutional rights when changed economic conditions and progress in the art of transportation placed the railroads in jeopardy. The auto and paved highways were certainly not intentionally evolved as a reply to the claims of the railroads presented by eminent counsel, but at present there is likelihood that alleged constitutional rights may become interesting fictions of little practical value. The railroads may be well pleased within the near future to obtain a return upon their prudent, unimpaired investment."

In closing, the statement recommends stricter regulation of highway carriers since there is no reason why these "should be allowed to perform only those functions which they choose to select and which deprive their competitors in many instances of the business which may be a material factor in keeping them alive. . . . . Our problem is to ascertain what form of transportation is best adapted to each condition, to bring the new forms of transportation under control as rapidly as possible and to establish a public policy which is wise and in the interest of the public."

* * *

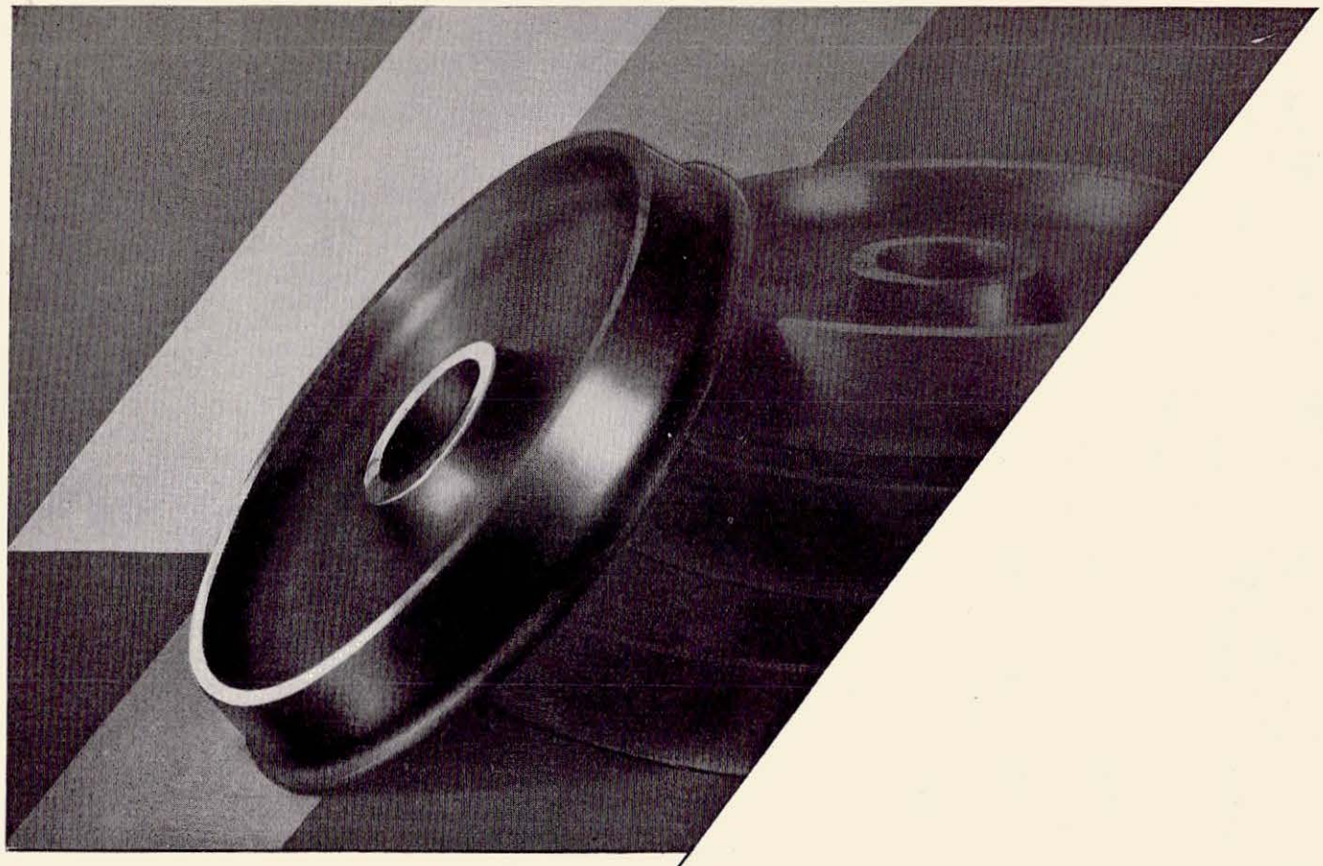
The Chicago & North Western will provide automobile baggage service between Chicago and the Black Hills of South Dakota for the summer tourist season between June 1 and September 30, the rate being five rail fares for two passengers and a car.

* * *

Markers Used by the Pennsylvania to Designate Stopping Points

In order to guide motormen of its main line suburban electric trains, which frequently carry 12 cars, in stopping at the right point for the convenience of passengers, the Pennsylvania has placed track markers at all stations between Broad Street, Philadelphia, and Paoli, Pa. Each marker indicates the stopping point for a train of a like number of cars. The above picture shows the marker for a six-car train at Narberth.

Continued on Next Left Hand Page



MODERN WHEELS FOR MODERN SERVICE

The high speed of modern transportation by rail demands rigorous safety measures which must include, in addition to efficient signal systems, the use of adequate materials in rolling stock and maintenance of way. The use of suitable wheels is particularly important, for here is the focal point of safety. Upon wheels rests the major share of responsibility.

In passenger service, where naturally the greatest safety precautions are taken, Carnegie Wrought Steel Wheels have long been recognized as the standard of excellence. Carnegie Light Weight Wrought Steel Wheels—made by the same process and of the same quality of steel—bring to freight service a similar measure of protection at minimum cost.

To serve even more efficiently, we are now prepared to furnish Rim-Toughened Wrought Steel Wheels for all classes of service. The process of heat treatment to which these wheels are subjected insures additional service out of all proportion to the small increase in cost. Carnegie Wheel engineers are at your service.

U S STEEL

CARNEGIE WROUGHT STEEL WHEELS

Product of Carnegie Steel Company, Pittsburgh, Pa., Subsidiary of United States Steel Corporation 121

Foreign

Russian Railways Being Block Signaled

The program of the Russian railroad administration for 1931 calls for equipping with block signaling 2,000 kilometers of the railway lines, according to an item in the Economic Review of the Soviet Union, published by Amtorg Trading Corporation, New York City. The first system of block signaling was installed between the stations Moscow-Volokolamsk on January 15. Beginning February 1, another section, Moscow-Mitishchi, was scheduled to be put in operation. These installations will permit the dispatching of trains between Moscow and Volokolamsk every 10 or 11 minutes and between Moscow and Mitishchi every 2½ minutes. In 1932-33 twenty thousand kilometers (12,423 miles) of railways will be equipped with block signaling.

7,000-Hp. Electric Locomotives for Swiss Federal Railways

Two electric locomotives are now being built for the Swiss Federal Railways which are rated at 7,000 hp. Information available at this time does not state if this is the maximum, one-hour or continuous rating. The electric locomotives will be 111 ft. 6 in. long and will weigh 245 tons. They are designed to haul passenger trains weighing 600 tons and freight trains of 750 tons over the steepest gradients of the International St. Gothard line at 37 miles an hour. The electrical parts for one of the locomotives are being built by the Oerlikon Company, Oerlikon, Switzerland, and for the other by the Brown, Boveri Company, Baden, Switzerland. The mechanical parts are being built by the Swiss Locomotive Works, Winterthur, Switzerland. The locomotives are intended for service on the Lucerne-Chiasso section of the St. Gothard line.

International Committee to Discuss Proposed Trans-Saharan Railway

A special committee—composed of representatives of the French, British, Belgian and Italian governments—is to meet in Paris (France), within the next few months to consider the future organization of the Trans-Saharan Railway. The proposed Sahara railway is now no longer regarded as a purely French enterprise, but is looked upon as the first section of a transcontinental line with which most of the powers who have African possessions will be concerned. The French section of the line will run south from Oran across the Sahara to the Niger river at Gao. It will then follow the river southeast to Niamey, where a junction would be made with the railway which runs through Dahomey to the Gulf of Guinea.

The co-operation of the British authorities is sought for a proposed extension of the railroad along the Niger from Niamey to link up with the railway system in Nigeria, and it is further proposed to continue this link line south-east through Nigeria, the Cameroons and French Equatorial Africa to the Belgian Congo. If the Belgian government consented, this line would be still further extended eastwards to a connection at Ujiji, Bukoba or Kisumu, with the railway system serving the British possessions in southern and southwestern Africa. The Italian government has also been considering the construction of a Trans-Saharan railway from Tripoli to Lake Chad, and the French interests are endeavoring to persuade the Italians that this line would be redundant.

The whole scheme will be discussed at the meetings of the committee, but whatever the attitude of the other powers, it is regarded as practically certain that the French government will proceed with the construction of the section from the Mediterranean to the Niger.

Southern of Britain Reorganizes Solicitation Methods

The Southern of Great Britain has recently reorganized its traffic solicitation organization along lines designed to cope with conditions attending the growing competition with highway carriers. The Southern, it is pointed out by Modern Transport (London) in a recent article outlining the plan, is particularly vulnerable to highway competition because 75 per cent of its business is passenger and its freight business involves comparatively short hauls.

The present reorganization is a development of the consolidation, last year, of the Southern's operating and commercial departments into a traffic department. Under the new plan each traffic solicitor will be responsible for both passenger and freight business within the convassing territory assigned to him. It is hoped that in time these solicitors will come to be regarded by patrons as advisors in connection with all transport problems which arise. The solicitors will be "engaged exclusively on outdoor canvassing, and relieved of all office work, and claims, etc., except as they may be otherwise instructed by the divisional superintendent or his assistant only."

The plan does not extend to off-line solicitation or to theatrical traffic since "Canvassing in areas off the company's system, and also of all theatrical traffic, will be performed by the canvassing staffs of the commercial assistant's department." A feature of the plan is the special care which has been devoted to the problem of quoting exceptional rates on short notice. A solicitor in an emergency may telephone or telegraph to the rates section; the latter promptly replies at the same time advising the divisional officer, to whom the solicitor reports, of its decision.

The map accompanying Modern Transport's outline of the reorganization shows the Southern's territory divided into five divisions; these are under the jurisdiction of divisional superintendents who supervise the work of solicitors operating in canvasser's areas embraced in their respective divisional territories.

Equipment and Supplies

LOCOMOTIVES

The Louisiana & Arkansas is now inquiring for two 2-8-2 type locomotives.

The Western Pacific has ordered five Mallet (2-8-8-2) type locomotives from the Baldwin Locomotive Works. Inquiry for this equipment was reported in the *Railway Age* of February 14.

The Amtorg Trading Corporation has ordered five of the 2-10-2 type locomotives from the Baldwin Locomotive Works and five of the 2-10-4 type locomotives from the American Locomotive Company, for export to Russia. Inquiry for this equipment was reported in the *Railway Age* of May 3.

FREIGHT CARS

The Chicago Tank Car Company is inquiring for one tank car of 10,000 gal. capacity.

The Norfolk & Western will rebuild 500 all-steel hopper coal cars at its Roanoke shops.

The Sanitary District of Chicago has given a contract for the repair of 20 air dump cars to the Ryan Car Company. Inquiry for bids on this work was reported in the *Railway Age* of January 17.

The Chicago & Eastern Illinois has provided for the retirement of 7,286 miscellaneous freight cars. Of these, 286 gondola cars are now being scrapped, while the remaining 7,000 are being offered for sale before being scrapped.

MOTOR COACHES

The New England Transportation Company, a subsidiary of the New York, New Haven & Hartford, has purchased seven type 250-33 passenger observation Yellow coaches from the General Motors Truck Company, Pontiac, Mich.

IRON & STEEL

The Western Pacific is inquiring for 10,350 tons of rails.

The Chicago, Milwaukee, St. Paul & Pacific plans to purchase 23,000 tons of rails in 1931.

The Delaware & Hudson is inquiring for 200 tons of steel for bridge work at Coopersville, N. Y.

The Chicago & North Western has ordered 500 tons of structural steel for a bridge at Blairstown, Iowa, from the American Bridge Company.

The Chicago, Milwaukee, St. Paul & Pacific has ordered 200 tons of structural steel for grade separation work at Milwaukee from the Truscon Steel Company.

Continued on Next Left Hand Page

TIGER WELD SIGNAL BONDS

THESE signal bonds are designed along new and improved lines. They enable the welder to make a perfect installation. For example—there are no wires to be welded on the job. This has already been done by the manufacturer.

The cylindrical solid steel terminal gives a large contact area and also enables the bond to be placed at any convenient angle. Installation can be made by either the oxy-acetylene flame with flux wire or by arcwelding with steel electrode. Write us for samples and detailed information.

A PERFECT WELD EVERY TIME

Type BW-2 for use on reinforced splice bars with widely projecting rib.

Type BW-1 for use on splice bars which permit using U shaped bonds.

1831 COMMEMORATING 100 YEARS of PROGRESS IN WIRE MAKING 1931

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago SUBSIDIARY OF UNITED STATES STEEL CORPORATION And All Principal Cities

Pacific Coast Distributors: Columbia Steel Company, Russ Building, San Francisco *Export Distributors:* United States Steel Products Company, New York

SIGNALING

THE ATLANTIC COAST LINE has ordered from the Union Switch & Signal Company material for automatic interlocking protection at Mattox, Fla., the crossing of the Seaboard Air Line. Color-light signals will be used.

Supply Trade

The Carnegie Steel Company has opened an office in the Atlas building, Columbus, Ohio.

H. W. Anderson has been elected assistant secretary of **Whitman & Barnes, Inc.**, Detroit, Mich.

The Worthington Pump & Machinery Corporation, Harrison, N. J., has moved its St. Louis district sales office to 1703 Ambassador building.

N. J. Kamen, formerly of The Alemite Corporation, has been appointed a representative of **The Edna Brass Manufacturing Company,** Cincinnati, Ohio. Mr. Kamen's headquarters are at Chicago.

Arthur W. Barth, vice-president and secretary of **Henry Giessel Company, Inc.,** Chicago, has been elected president to succeed **Henry Giessel,** deceased. **D. R. Rader,** assistant secretary, has been appointed secretary.

Fred S. Wilcoxen, formerly associated with the **Edna Brass Manufacturing Company,** Cincinnati, Ohio, has been elected vice-president of the **Standard Locomotive Equipment Company,** 1316 McCormick building, Chicago.

Nelson S. Gotshall, eastern salesmanager of the Bishop & Babcock Manufacturing Company, Cleveland, O., with headquarters at New York, has been appointed assistant to the president of the **White Motor Company,** with headquarters at Cleveland.

W. R. Toppan, who has been identified with railroad water treatment for 22 years, has joined **The Permutit Company,** manufacturers of water treating equipment. Mr. Toppan's headquarters are at the main office of The Permutit Company, 440 Fourth avenue, New York.

W. A. McCallum has resigned as president and managing director of the Economy Railway Appliance Company, Ltd., and has been appointed president and managing director of the **Reliance Railway Appliance Company, Ltd.,** 712 Railway Exchange building, Montreal, Canada. This company has the sole manufacturing and selling rights in Canada and the United States for the Economy tender water level indicator.

The General Electric Company, Schenectady, N. Y., has disposed of its trolley line material business to the **Ohio Brass Company,** Mansfield, Ohio. This includes overhead materials for electric railways, electrified mines, industrial haulage, and electrified steam roads. This is a field in which the Ohio Brass Company has specialized intensively for many years. This transaction is relatively of small importance because of the volume of business involved, and, although of some advantage to both companies, it is principally of benefit to the users of this class of material.

William C. Dickerman, president of the **American Locomotive Company,** has been elected also chairman of the board of the **Ames Pump Company, Inc.,** a division of the American Locomotive Company; **David T. Williams,** assistant to the vice-president in charge of engineering of the American Locomotive Company, has been elected president and a director of the Ames Pump Company, Inc., and **John D. Finn,** secretary of the American Locomotive Company, has been appointed secretary also of the Ames Pump Company, Inc., all with headquarters at New York. David T. Williams, the new president of the Ames Pump Company, Inc., was educated at the University of South Wales and served an apprenticeship in the mechanical department of the Barry Railway Company, now a part of the Great Western Railway System of Great Britain. He subsequently served until August, 1901, as chief draftsman and then entered the employ of the Cooke plant of the American Locomotive Company as a draftsman and the following year was transferred to the New York office. He resigned in May, 1904, to go as mechanical engineer for a company handling mining machinery in Johannesburg, South Africa. He subsequently served with mining interests in Johannesburg, consecutively, as resident engineer and mechanical engineer, and in 1906 returned to the United States as mechanical engineer with the C. H. Wheeler Company, Philadelphia, Pa. Later he became chief engineer for the General Cement Products Company, resigning in 1911 to engage in the development of a mechanical stoker for locomotives which resulted in the formation of the Standard Stoker Company. He volunteered to serve during the World War and was field officer of the United States Shipping Board, Emergency Fleet Corporation, then assistant to the head of the Steel Ship Production Section. In December, 1918, he was assigned the district managership of the Southern district with supervision of all shipbuilding then being carried on by the United States Shipping Board in that territory which was later extended to include all shipyards between Savannah, Ga., and Brownsville, Tex. In August, 1921, Mr. Williams resigned from the Shipping Board and after traveling for a year in Europe he served as consulting mechanical engineer for a company engaged in the development of oil refining equipment. He returned to the American Locomotive Company on April 1, 1926, serving since that time as assistant to vice-president in charge of engineering.

Eugene Brandeis, who has been elected president of the **Lundie Engineering Corporation,** New York, has been connected with the corporation since its formation in 1919. Prior to that time he served for a number of years with the Pennsylvania Railroad in its maintenance of way department, Philadelphia, Pa. He was secretary and treasurer of the Lundie Engineering Corporation to June, 1929, and then was elected vice-president which position he held at the time of his recent election as president of the same corporation.

Eugene Brandeis

L. B. Armstrong, who has been elected vice-president of the **Lundie Engineering Corporation,** was born at Lauderdale, Miss. He began railway work in 1905 with the Louisville & Nashville as station agent and telegraph operator serving consecutively to March, 1908, as operator, agent and cashier. The following month he went to the Birmingham Southern, a subsidiary of the United States Steel Corporation, at Birmingham, Ala., and served in various capacities. Mr. Armstrong went to the Lundie Engineering Corporation, New York, in April, 1919. In May, 1923, he was promoted to western manager at Chicago, which position he held until his recent election as vice-president of the same corporation. Mr. Armstrong will have his headquarters at Chicago.

L. B. Armstrong

Continued on Next Left Hand Page

THE STAYBOLT OF "TEA-KETTLE" DAYS

is out of place on Modern Power

■ Staybolt material has been vastly improved in recent years.

■ Staybolts of Toncan Iron have many unique advantages. Because they are uniform in composition and free from slag spots and seams, they thread and work easily. In addition to the fatigue resistance for which iron is famous, staybolts of Toncan Iron have a superior resistance to corrosion—of particular importance where water is bad. Years of service bear this out.

■ Some roads find that alloy steel staybolts better meet their present day requirements. For such service, Republic metallurgists developed a special Agathon steel that is now in use on several leading railroads.

■ But whether you prefer iron or steel, use the improved and proved staybolt materials supplied by Republic.

TONCAN COPPER Mo-lyb-den-um IRON

AGATHON NICKEL IRON

Central Alloy Division

REPUBLIC STEEL CORPORATION

Massillon, Ohio

The American Brake Shoe & Foundry Company

Net earnings of $2,906,385 were reported by the American Brake Shoe & Foundry Company for the year ending December 31, 1930, as compared with net earnings of $3,230,231 for the year ending December 31, 1929. The 1930 earnings are equivalent, after payment of preferred dividends, to $3.24 per share on the outstanding common as against 1929 earnings equivalent to $3.71 per share.

Of the foregoing 1930 earnings, $590,788 was received from dividends of companies controlled but not fully owned by the American Brake Shoe & Foundry Company. The consolidated balance sheet at the close of the year lists total current assets at $13,760,949 against total current liabilities of $1,682,331. Cash and call loads amounted to $2,454,931 or an amount substantially in excess of the current liability figure. Current assets also included marketable investments of $4,216,453, carried at their December 31 market value. The report states that a decrease in the company's orders commenced in August, 1929, and continued with only minor interruptions until December, 1930. In the latter month, however, a slight change for the better was noted and this has continued. The value of 1930 shipments, as compared with those of the previous year, showed a reduction of 25 per cent. During the year the company increased its holdings of American Manganese Steel Company stock to 97.85 per cent of the total outstanding; at the close of 1929 the American Brake Shoe & Foundry Company's ownership of American Manganese Steel represented a 92 per cent interest in the latter.

OBITUARY

W. J. Stanton, railway sales engineer of Automatic Electric, Inc., Chicago, died on February 12 at his home at Wheaton, Ill.

Hamilton A. West, vice-president of the International Creosoting & Construction Co., Galveston, Tex., died in that city on February 20.

TRADE PUBLICATIONS

ELECTROPLATING ALUMINUM.—"Electroplating Aluminum" is the title of a 36-page booklet issued by the Aluminum Company of America, Pittsburgh, Pa., describing the steps necessary for the cleaning and plating of aluminum both on smooth and roughened surfaces. Diagrams summarize the various procedures discussed.

IN THE LAND OF KING COTTON.—The Southern, operating through a territory where are located more cotton spindles than on any other railroad in the world, and whose freight cars carry a larger volume of cotton products than those of any other railway, signifies this characteristic of its territory by using a special cotton fabric on which to print the bills of fare in the dining cars of the Crescent Limited.

Financial

ATLANTA, BIRMINGHAM & COAST.—*Supreme Court Declines to Review Question of Accounting.*—The Supreme Court of the United States, in a decision rendered on February 24, held that it was without jurisdiction to review what the company had challenged as an illegal order of the Interstate Commerce Commission concluding that the amount to be included in the balance sheet account of the company representing investment in road and equipment as of January 1, 1927, may not exceed $9,261,043, representing the cost to it of the property of the Atlanta, Birmingham & Atlantic. The company had sought to set up the amount of $29,271,859, as representing the commission's valuation of the property with adjustments for additions, but the commission held that the value of the property for rate-making purposes was not pertinent or material evidence in the determination of investment. The court said that the commission had issued no formal order. The district court had held that the commission had issued an invalid order and had ordered the commission to allow a rehearing. The commission did so but declined to change its conclusion.

CANADIAN PACIFIC.—*Acquisition.*—This company has applied to the Interstate Commerce Commission for authority to acquire control of the Aroostook Valley, by purchase of 2,000 shares of its stock for $529,740.

GREAT NORTHERN PACIFIC.—*Unification Application Dismissed.*—The Interstate Commerce Commission on February 19 entered a formal order dismissing the applications for authority for the acquisition of control of the Great Northern and Northern Pacific railways, at the request of the companies.

MASCOT & WESTERN.—*Abandonment.*—The Arizona Corporation Commission has granted this railroad which extends between Willcox, Ariz., and Dos Cabezas (Mascot), 15 miles, permission to abandon its operations for an indefinite period. An exhibit submitted by the railroad, which is owned by the Central Copper Company, showed that operations during 1928, 1929 and 1930 resulted in an accumulated deficit of $65,238.

MISSOURI PACIFIC.—*Bonds.*—The Interstate Commerce Commission has authorized this company to issue $61,200,000 of first and refunding mortgage 5 per cent bonds, series I, maturing in 1981, to be sold to J. P. Morgan & Co. at 92½ making the annual cost to the railroad 5.44 per cent.

PENNSYLVANIA.—*Interest in New England Roads.*—General W. W. Atterbury, president of this company, testifying in Boston before the Massachusetts State Legislature's Committee on Transportation, stated that his company owned 14.36 per cent of the common and preferred stock of the New York, New Haven & Hartford and that the holdings of the Pennroad Corporation, if added to those of the P.R.R., would bring the total held by both companies to about 21 per cent. He stated that the Pennroad Corporation owned about 17 per cent of the stock of the Boston & Maine. R. H. Spaulding, chairman of the New England Governors' Committee, estimated that the P.R.R.'s and the Pennroad Corporation's interest in the Boston & Maine and the New York, New Haven & Hartford totaled 17.7 per cent of the total capitalization of these companies. The combined interest of the New Haven and the Pennroad in the Boston & Maine he put at 42.91 per cent of the voting stock, compared to an estimate of 46 per cent, made by T. N. Perkins, chairman of the Boston & Maine. General Atterbury favored no radical disturbance of New England railroad relationships at the present time but gave as his opinion that if any consolidation steps were taken the initial one should be the consolidation of the New Haven and the Boston & Maine because of the beneficial effects to Southern New England. He favored the free interchange of traffic with all trunk lines but if the New York Central interests in the Boston & Albany continued, as well as the interests of the Canadian Pacific and Canadian National in the New England lines, he favored a closer relationship between the New Haven, the Boston & Maine and the Pennsylvania Railroad. He showed an interest by New England investors in the Pennsylvania and the Pennroad quite comparable to the interest of these companies in the railroads of New England. He stated that there were 18,418 stockholders of the Pennroad Corporation in New England, 12.7 per cent of the total. New England P.R.R. stockholders, he said, totaled 30,535, or 13.08 per cent of the total, their holdings having a market value in excess of $100,000,000. He emphasized the fact, also, that the Pennsylvania has no financial interest whatsoever in the Pennroad Corporation.

PERE MARQUETTE.—*Bonds.*—A syndicate headed by J. P. Morgan & Co. is offering, subject to the approval of the Interstate Commerce Commission $8,000,000 of this company's 4.5 per cent series C bonds, maturing in 1980. The issue is priced at 99.5.

PERE MARQUETTE.—*Bonds.*—This company has applied to the Interstate Commerce Commission for authority to issue and sell $8,000,000 of first mortgage 4½ per cent bonds and to procure authentication and delivery of $6,386,000 of similar bonds. The purpose is to reimburse the treasury for expenditures.

SOUTHERN. — *Bonds.* — The Interstate Commerce Commission has authorized an issue of $1,310,000 of first consolidated mortgage bonds, to be sold at not less than 107 and interest, and the proceeds to be used to retire an equal amount of underlying bonds maturing March 1.

WARRIOR RIVER TERMINAL.—*Stock.*—This government-controlled company has been authorized by the Interstate Commerce Commission to issue $1,150,000 of capital stock to be sold to the Inland Waterways Corporation at par.

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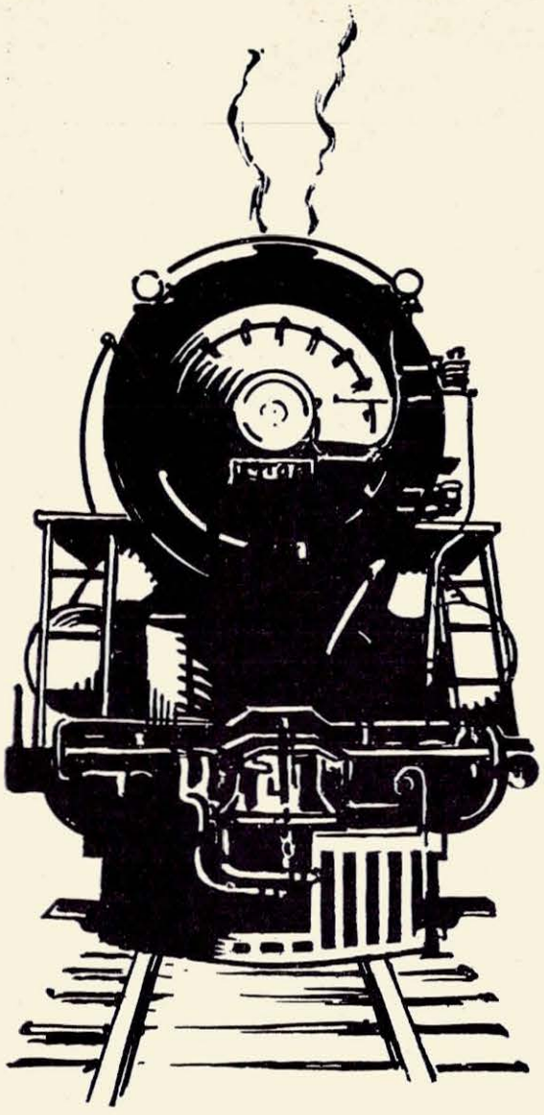
PULLING FIRES



A LOCOMOTIVE out of a terminal with present day grates, green fire, a wide open throttle and a long cut-off presents a condition that requires a deep fire otherwise it will be lifted and deposited under the arch or over it.

FIREBARS that make

BETTER FIRES

will leave a terminal with only enough fire to cover them (as little as two inches) and it remains there under all conditions.

Division after division is covered without any material increase in depth.

FIREBAR CORPORATION

CLEVELAND OHIO

FIREBAR

Average Prices of Stocks and of Bonds

	Feb. 24	Last week	Last year
Average price of 20 representative railway stocks.	96.47	94.12	133.66
Average price of 20 representative railway bonds..	94.14	94.06	92.44

Dividends Declared

Chesapeake Corporation.—Common, $.75, quarterly, payable April 1 to holders of record March 7.

Chesapeake & Ohio.—Common, $.62½, quarterly, payable April 1 to holders of record March 7; Preferred, $3.25, payable July 1 to holders of record June 8.

Chestnut Hill, $.75, quarterly payable March 4 to holders of record February 21 to March 3.

Consolidated Railroads of Cuba.—Preferred 1½ per cent, quarterly, payable April 1 to holders of record March 10.

Cuba Northern Railways.—Common, $1.43, payable March 30 to holders of record March 30.

Cuba Railroad.—Common, $.80 payable March 30 to holders of record March 30.

Delaware & Bound Brook.—2 per cent, quarterly, payable February 20 to holders of record February 17.

Maine Central.—Common, 1¼ per cent, quarterly, payable April 1 to holders of record March 16.

Pere Marquette.—Common, 1½ per cent, quarterly, payable April 1 to holders of record March 7; Preferred and Prior Preference, 1¼ per cent, quarterly, payable May 1 to holders of record April 4.

Philadelphia, Germantown and Norristown. — $1.50, quarterly, payable March 4 to holders of record February 21 to March 3.

Southern Pacific Co.—1½ per cent, quarterly, payable April 1 to holders of record February 24.

Construction

ATCHISON, TOPEKA & SANTA FE.—The North Texas & Santa Fe has been authorized by the Interstate Commerce Commission to acquire and complete the construction of a line being built by the Panhandle & Santa Fe from Spearman, Tex., to Morse, 18.6 miles.

CHICAGO, MILWAUKEE, ST. PAUL & PACIFIC.—A contract for the construction of a one-story brick and steel fruit storage building at Ninth avenue and Second street, Minneapolis, Minn., has been awarded to Pike & Cook, Minneapolis, at a cost of about $100,000.

ILLINOIS CENTRAL - LOUISIANA & ARKANSAS.—Major General Lytle Brown, chief of the United States Engineer Corps, has proposed a plan which will be submitted to these railroads, for the construction of an emergency crossing over Bonnet Carre spillway between the Mississippi river and Lake Pontchartrain, to be used only when the spillway is in operation. This suggestion would eliminate the necessity of constructing a permanent elevated line across the spillway to accommodate the Illinois Central, the Louisiana & Arkansas and the Yazoo & Mississippi Valley. Except during periods when the spillway is in use the railroads would operate on their present lines through gaps in the spillway levees.

NATIONAL OF MEXICO.—Construction of about 1,000 miles of railroad, which when completed will be operated as a part of the National Railways system, has been authorized by the Mexican Department of Public Works, with the approval of President Ortiz Rubio. Federal appropriations to cover a portion of this construction have been granted. One of these lines will be constructed between Mexicali, B. Cfa., on the Inter-California, and Santa Ana, Son., on the Southern Pacific of Mexico, about 300 miles. The cost of constructing this line, which is already under way, will be borne jointly by the Mexican government, the State of Sonora and the Northern territory of Lower California. A second line, 450 miles in length, will be constructed in Southeastern Mexico between Santa Lucrecia, Ver. C., on the National Railways, and Campeche, Cam., on the United Railways of Yucatan. An appropriation of $250,000 has been made by the federal government to start this work, which will be supplemented by an appropriation of $500,000 by the States of Tabasco and Campeche. A third line will be constructed from Aristeo, Micho., to Zihuatanejo, Gro., a proposed port on the Pacific ocean about 200 miles. The federal government has appropriated $200,000 for starting this construction and the States of Michoacan and Guerrero will also share in the cost. While construction of the line between Tampico, Tam., and Mexico, D. F., was temporarily suspended a few weeks ago, work is to be resumed within a short time. The government also has under consideration prosecution of the long-deferred project to construct a railroad between Tampico and Matamoros on the Rio Grande, about 300 miles.

NEW YORK & LONG BRANCH.—The Board of Public Utility Commissioners of New Jersey has directed this company to eliminate its grade crossing at North Lincoln avenue, Elberon, N. J., by carrying the highway under the grade of the railroad. Fifty per cent of the cost of construction, which is to be started by May 1, is to be paid by the state.

NEW YORK CENTRAL.—The Public Service Commission of New York has approved plans and an estimate of cost amounting to $53,500 for the elimination of State street crossing of this company's lines in Harrisville, N. Y.

OREGON ELECTRIC.—The Interstate Commerce Commission has authorized this company to construct 40 miles of railroad in Lane County, Ore. The new line will run from a point between Danebo and Maywood, 4.8 miles west of Eugene, Ore., on the Southern Pacific's Coos Bay branch, in a general southerly direction through Hadleyville, Ore., to a point on the Suislaw river, 30 miles, with a branch from Hadleyville, southwesterly to Panther, 10 miles. Construction, which is estimated to cost $1,231,467, is to be started by April 1, 1931, and to be completed by March 31, 1932. The Commission's certificate also authorizes the Oregon Electric to operate over the Coos Bay branch of the Southern Pacific between Eugene and the starting point of the new line, and provides that the Southern Pacific shall be entitled to secure operating rights over the new line of the Oregon Electric at any time within five years from the date of its completion.

PENNSYLVANIA.—A contract has been awarded to the James McGraw Company, Philadelphia, Pa., for the construction of a bridge over State Highway route No. 141 at Schuylkill Haven, Pa. The work will cost about $27,000.

Railway Officers

EXECUTIVE

E. E. Fairweather, who has been appointed general executive assistant, in addition to his duties as counsel, of the Canadian National, as announced in *Railway Age* of February 14, page 390, was born at Apohaqui, Kings Co., N. B., on April 30, 1884. He received his education at Digby and Picton Academies, Kings University, N. S., from which he was graduated in 1905, Acadea University, N. S., class of 1909, and Dalhousie University (law), class of 1912. He commenced his career on July 19, 1912,

E. E. Fairweather

with the Department of Railways and Canals (Canadian Government), as assistant solicitor. In 1915, he was appointed departmental solicitor, from 1917 to 1923 he held the position of counsel, and from 1918 to 1923 he also served as assistant general counsel, Canadian National, Ottawa. In 1923 he was appointed assistant general counsel of the C. N. R. at Montreal, Que., and in 1928 he became counsel. On December 23, 1930, Mr. Fairweather was appointed general executive assistant in addition to his duties as counsel. He was appointed Kings Counsel by the Province of Nova Scotia in 1929.

OPERATING

M. A. Mulligan, superintendent of the New Jersey & Lehigh division of the Lehigh Valley, with headquarters at Easton, Pa., retired on February 7, because of ill health. Effective also on that date the Mahanoy & Hazleton and the New Jersey & Lehigh divisions were consolidated into the Lehigh division; **Raymond L. Gebhardt,** superintendent of the Wyoming division was transferred to serve in the same capacity on this new Lehigh division with headquarters at Easton and Hazleton, Pa., and **Frank S. Mitten,** superintendent of the merged Mahanoy & Hazleton division, has been transferred to succeed Mr. Gebhardt as superintendent of the Wyoming division, with headquarters at Wilkes-Barre, Pa.

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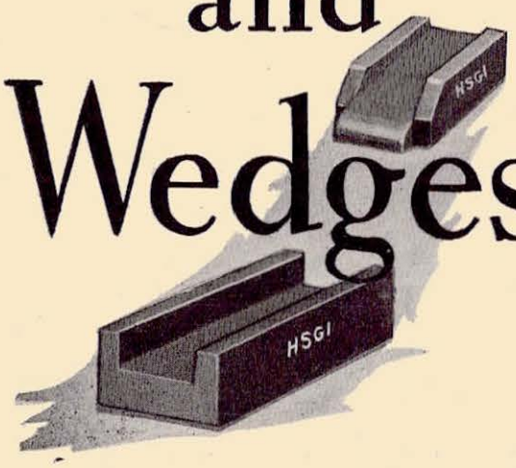
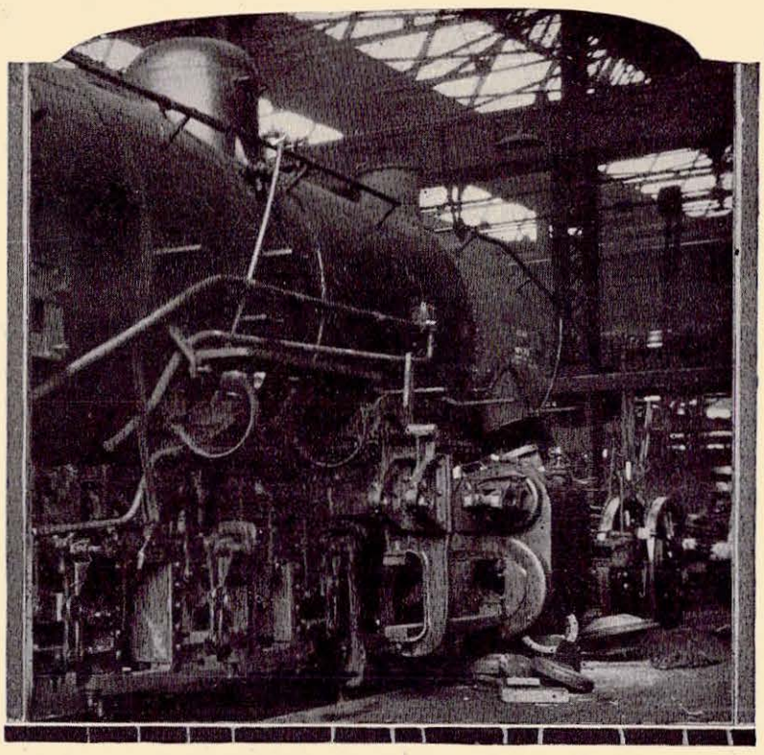
Shoes and Wedges





SHOES and wedges made of HUNT-SPILLER *Air Furnace* GUN IRON insure continuity of locomotive operating efficiency.

Their exceptional wear-resisting qualities eliminate the necessity of frequent wedge adjustments, help to maintain running gear alignment and materially reduce those destructive driving box pounds which are directly responsible for a good percentage of locomotive running repairs.

Years of service on America's leading railroads prove conclusively that HUNT-SPILLER *Air Furnace* GUN IRON shoes and wedges have a service life extending over many shopping periods.

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Cylinder Bushings
Cylinder Packing Rings
Pistons or Piston Bull Rings
Valve Bushings
Valve Packing Rings
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Shoes and Wedges
Floating Rod Bushings

Parts Finished for Application

Dunbar Sectional Type Packing
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(Duplex Springs for Above Sectional Packing)
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HUNT-SPILLER *Air Furnace* GUN IRON

Thomas M. Milligan, who has been promoted to superintendent of the Joliet division of the Elgin, Joliet & Eastern, with headquarters at Joliet, Ill., has been connected with the operating department of that road for nearly 30 years. He was born at Marion, Iowa, on February 16, 1886, and attended the public schools at Joliet. Mr. Milligan entered railway service on April 1, 1901, as a caller on the E., J. & E., later serving as a clerk. In 1906 he became a brakeman and in the following year he was advanced to conductor. In October, 1917, he was promoted to assistant trainmaster, then being further promoted to trainmaster in February, 1927. Mr. Milligan's promotion to superintendent of the Joliet division of the E., J. & E. became effective on January 1.

TRAFFIC

A. G. St. John has been appointed general agent of the St. Louis Southwestern at Tyler, Tex.

Edward Rutherford, Jr., has been appointed assistant general agent of the freight department of the Southern Pacific at New York.

J. G. Krener, who has been appointed general passenger agent of the Western Maryland with headquarters at Baltimore, Md., was born on March 7, 1879, at Baltimore, Md., and received his education at St. John's School, Baltimore, and at the Baltimore Business College. He entered railroad service on March 1, 1899, with the Western Maryland, as stenographer in the trainmaster's office at Baltimore, and in January, 1900, he was transferred to the traffic department as stenographer to the general freight and passenger agent. In 1905, he became chief clerk in the office of the advertising and ticket agent and in July, 1909, he was appointed chief clerk in the passenger department. On September 1, 1917, Mr. Krener was promoted to assistant general passenger agent, in which capacity he served until his recent promotion, with the exception of the period of Federal Control, July 1, 1918, to January 15, 1920, when he was connected with the passenger department of the Baltimore & Ohio.

MECHANICAL

G. T. Callender, master mechanic of the Joplin and White River divisions of the Missouri Pacific, with headquarters at Nevada, Mo., has been transferred to the Central Kansas and Wichita divisions, with headquarters at Osawatomie, Kan., succeeding **E. R. Hanna** and **G. Schepp,** who had headquarters at Osawatomie and Wichita, respectively. Mr. Hanna has been transferred to the Arkansas division, with headquarters at Little Rock, Ark. Mr. Schepp has been transferred to the Joplin and White River divisions at Nevada to replace Mr. Callender. Mr. Hanna succeeds **H. W. Reinhardt,** who has resigned to become assistant superintendent of motive power of the Chicago Great Western.

PURCHASES AND STORES

Edward F. Hasbrook, assistant purchasing agent of the Chicago, Burlington & Quincy, has been promoted to purchasing agent, with headquarters as before at Chicago, succeeding **Joseph R. Haynes,** deceased. **J. P. Blum,** chief clerk in the purchasing department at Chicago, has been promoted to assistant purchasing agent to succeed Mr. Hasbrook.

MOTOR TRANSPORT

George J. Loftus has been appointed manager, department of tours, of the Pacific Greyhound Lines, Inc., Pacific Greyhound Lines of Texas, Inc., and the California Parlor Car Tours Company, with headquarters at San Francisco, Cal. The position of passenger traffic manager of the California Parlor Car Tours Company has been abolished.

OBITUARY

Carl B. James, general development agent of the Louisville & Nashville, with headquarters at Louisville, Ky., was killed when he was shot through the heart on a highway near Bardstown, Ky., on February 23, by two men whom he had given a ride in his automobile. Mr. James was 58 years of age.

Delos W. Cooke, who died on February 10 in a hospital at Phoenix, Ariz., after an operation for intestinal cancer and complications, as announced in *Railway Age* of February 14, page 392, was born at Lewiston, N. Y., on December 31, 1862. He began his railroad career in May, 1881, serving in the passenger department of the Chicago & North Western, the Chicago Great Western and other western lines. For several years Mr. Cooke served as general passenger agent and later general traffic manager and vice-president of the Erie, retiring from the service of that road in 1918, when the government took over the railroads. In the World War, Mr. Cooke represented the Red Cross in both this country and Europe. He was a member of the board of directors of the Baltimore & Ohio, of the National Railway Publication Company and of certain railroads in the Erie system.

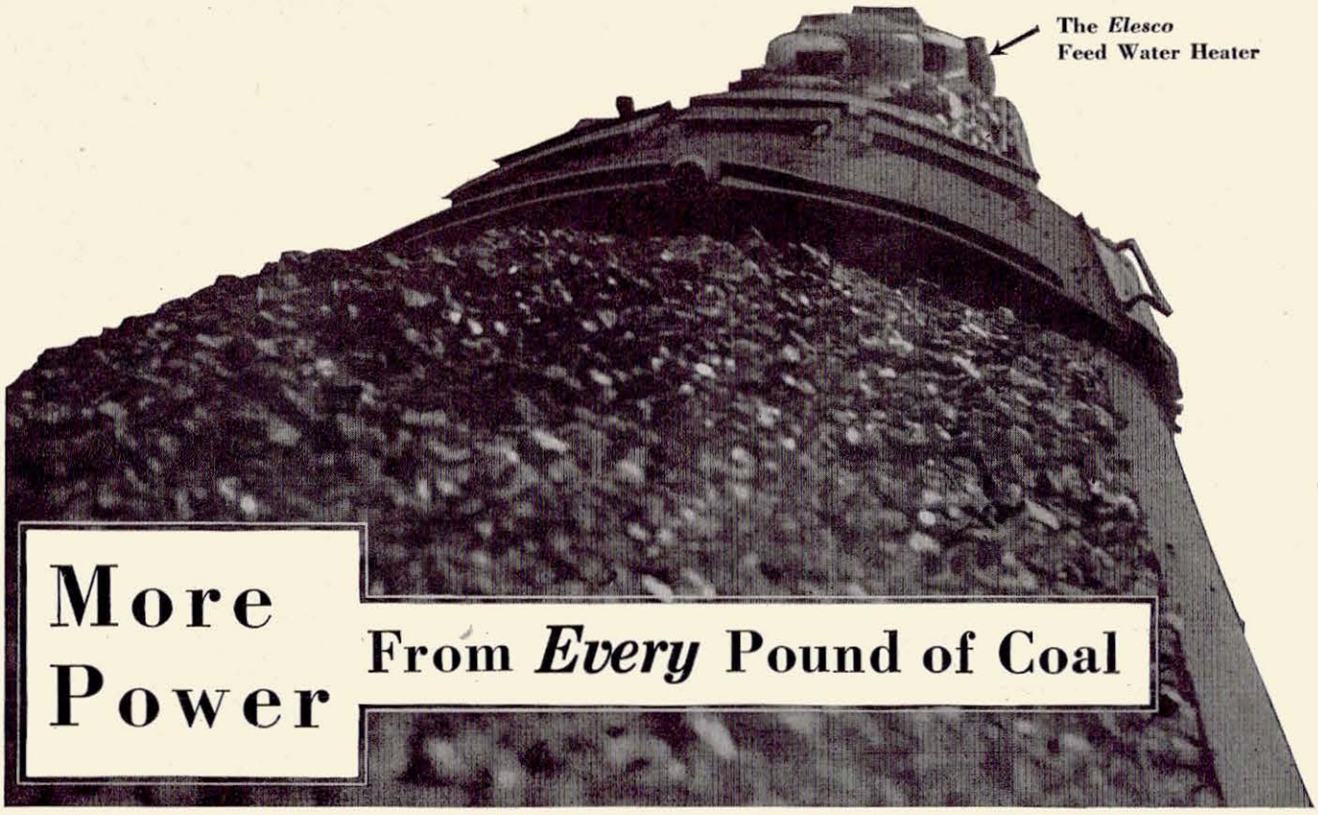
R. H. Carleton, assistant general auditor of the Chicago, Rock Island & Pacific, with headquarters at Chicago, died at Rochester, Minn., on February 17, of pneumonia contracted following an operation. Mr. Carleton had been connected with the Rock Island for 16 years. He was born at Haverhill, Mass., on June 28, 1880, graduating from Dartmouth College in 1902 and from a post graduate course at the Amos Tuck School of Administration and Finance in 1903. In the same year he entered railway service as a clerk in the office of the comptroller of the Rock Island at Chicago. He was advanced to chief clerk to the comptroller in 1906, then being promoted to assistant auditor of disbursements in 1911. During federal control of the railroads, from 1918 to 1920, he served with the United States Railroad Administration, returning to the Rock Island in 1921 as auditor of disbursements. Mr. Carleton was promoted to assistant general auditor in 1928.

Warren B. Kniskern, former passenger traffic manager of the Chicago & North Western, died on February 20 at Louisville, Ky. Mr. Kniskern, who had been engaged in railway service for nearly 41 years, prior to his retirement in 1910, was born at Carlisle, N. Y., on July 7, 1851. He obtained his first railroad experience as a messenger in the general passenger department of the Illinois Central in October, 1869. In 1873 he entered the service of the North Western in charge of foreign reports in the general ticket office, two years later becoming chief ticket clerk of the New Orleans, Jackson & Northern (now part of the Illinois Central) at New Orleans, La. After nine years with the Louisville & Nashville and the Chicago, St. Louis & Pittsburgh (now part of the Pennsylvania) he returned to the North Western on September 1, 1885, as assistant general passenger agent. Ten years later he was promoted to general passenger and ticket agent, serving from August 21, 1902, to May 1, 1910, as passenger traffic manager, with headquarters at Chicago.

Joseph R. Haynes, purchasing agent of the Chicago, Burlington & Quincy, with headquarters at Chicago, died at St. Luke's hospital in that city on February 20 following an illness of three weeks. Mr. Haynes had been connected with that railroad for 44 years. He was born at Chicago on December 29, 1868, and

Joseph R. Haynes

obtained his first railway experience as an office boy in the purchasing department of the Burlington. During the following five years he served in that capacity and in a number of other minor positions, then being advanced to chief clerk in the purchasing department in 1892. Mr. Haynes was promoted to assistant purchasing agent in 1905 and had been purchasing agent since September 1, 1928.



More Power From *Every* Pound of Coal

"Locomotive design has made great progress during the period since 1918. Steam consumption has been decreased from 20.5 pounds per horsepower hour to 18.5 pounds, and coal consumption from 120 pounds per hour per square foot of grate surface to 100 pounds or less."

—Dec. 1930, National City Bank Monthly Bulletin

An important factor in realizing these savings is the Elesco feed water heater which is actually an auxiliary boiler. It adds 15 per cent to any boiler without taking heat from the firebox, because it uses exhaust steam which otherwise would be wasted.

Your new power should include them. Apply Elesco feed water heaters to your existing power—you cannot afford to be without them.

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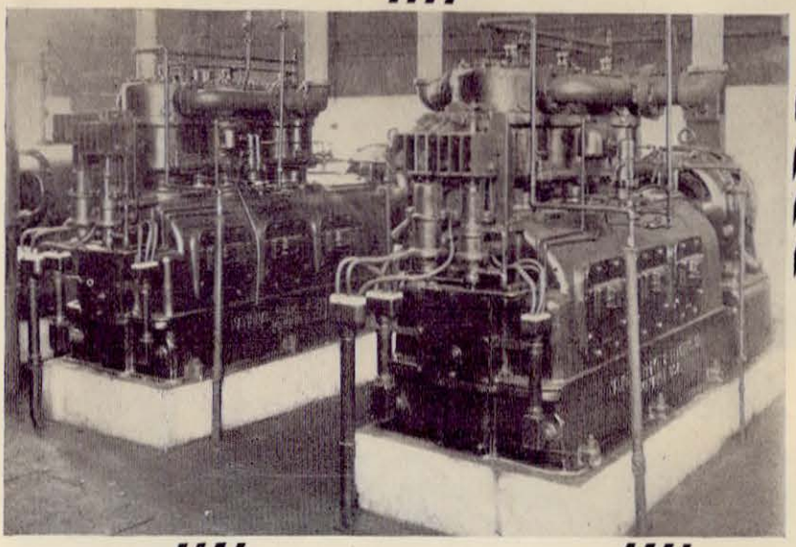
Superheaters
Exhaust Steam Injectors

Feed Water Heaters
Superheated Steam Pyrometers

A-560

Where **DURABILITY** *is outstanding*

there you'll find



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Trouble-free service year after year is common with Westinghouse-National Air Compressors. They are built to endure. Reliability and low maintenance are their outstanding characteristics. Hundreds of them are being used by railroads, with marked success, for every conceivable pneumatic requirement... The two machines illustrated-3VS-24, 335 cu. ft. displacement - have been in constant service day and night since 1923, furnishing air for yard charging and shop use. No maintenance work has been needed during this time other than the grinding of valves, and the compressors are good for many more years of service. Scores of their predecessors have been in use for fifteen to twenty years. . . . . .

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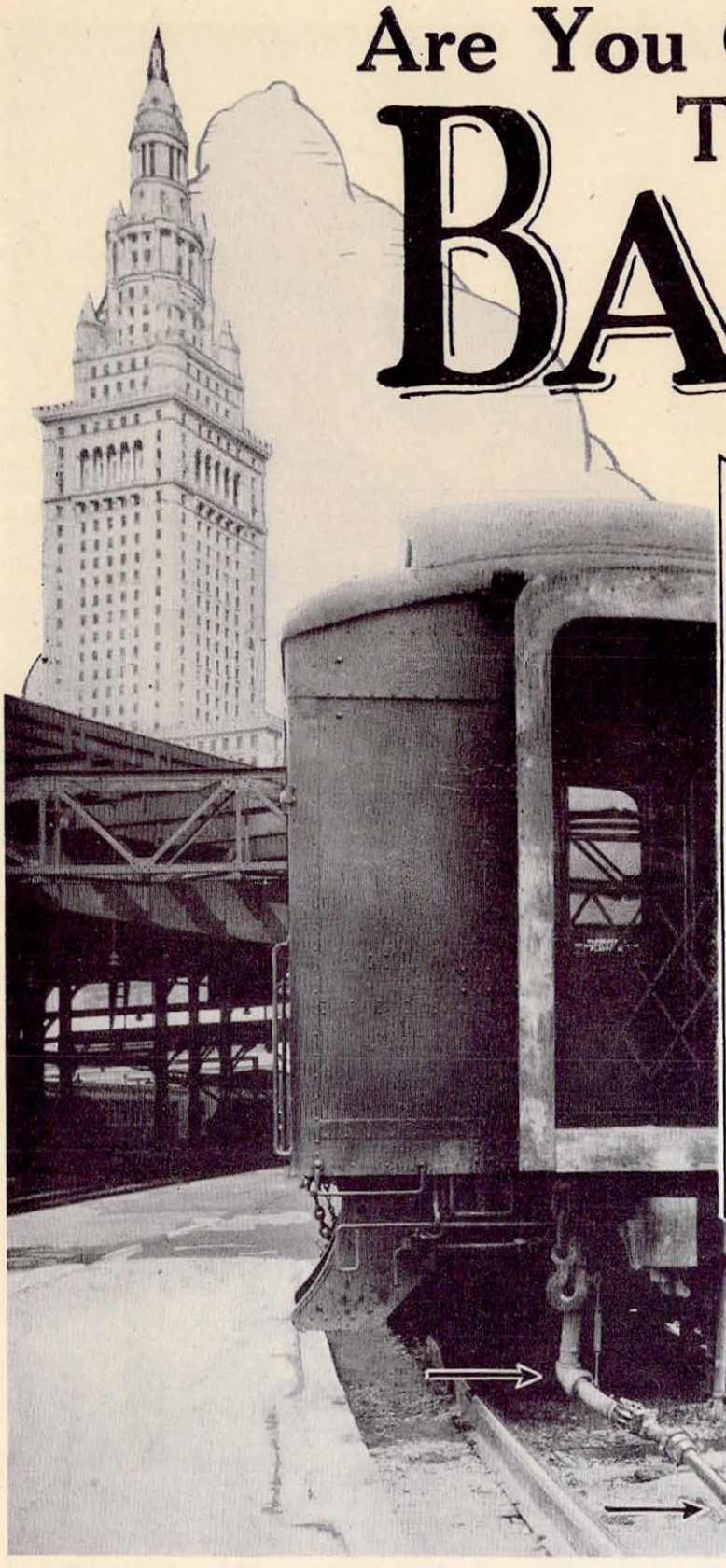

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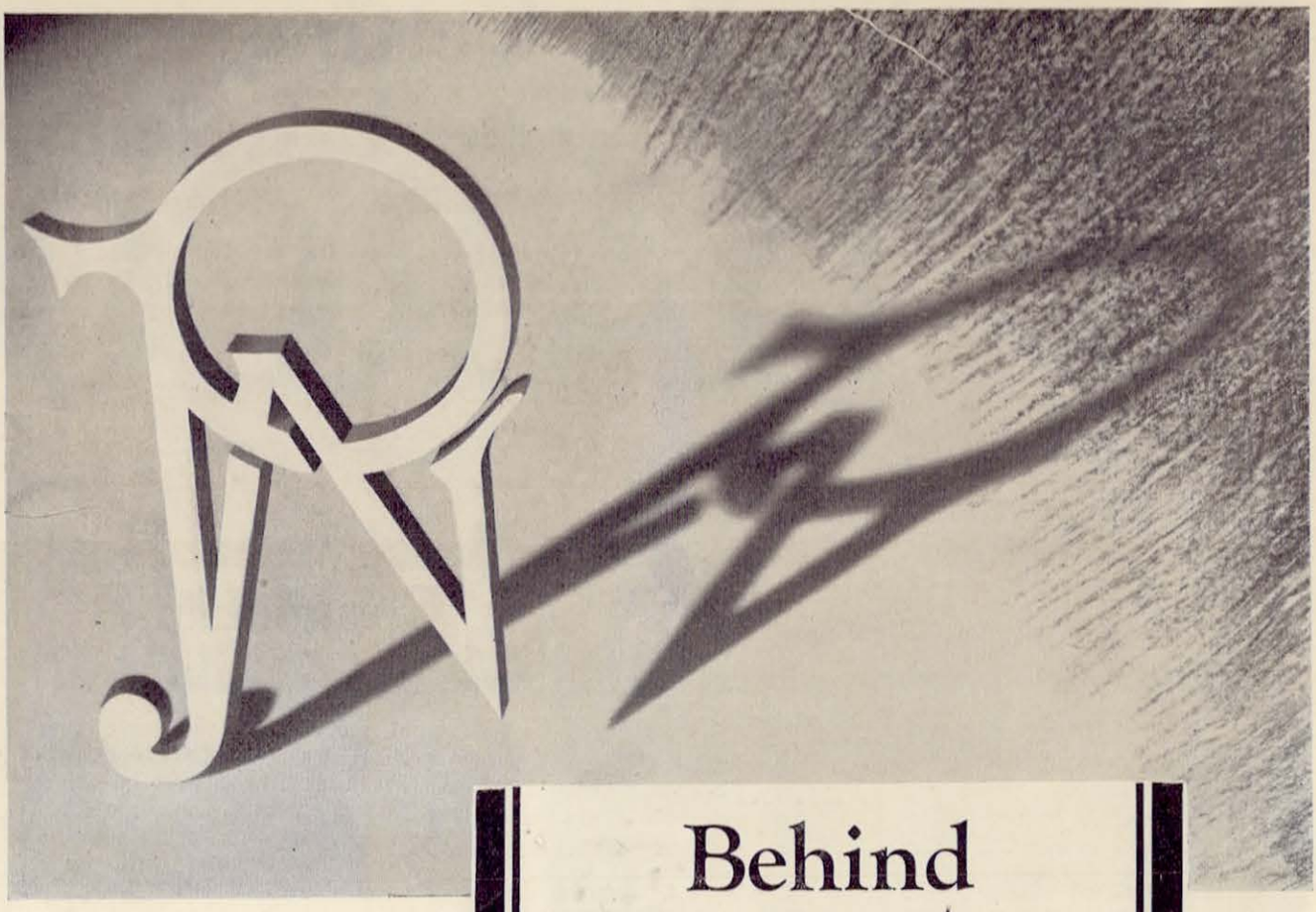

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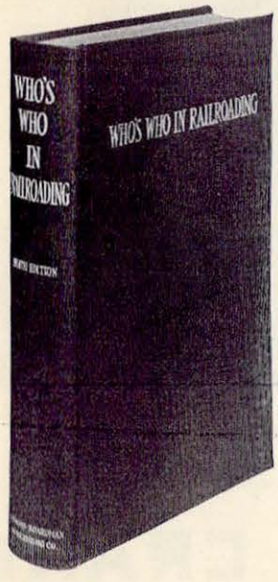

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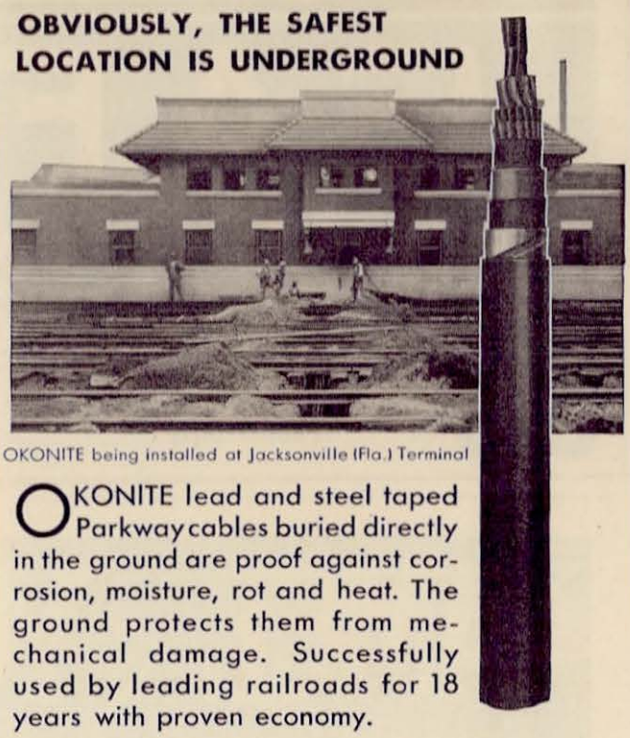

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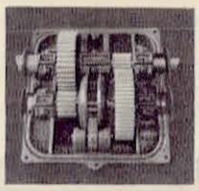

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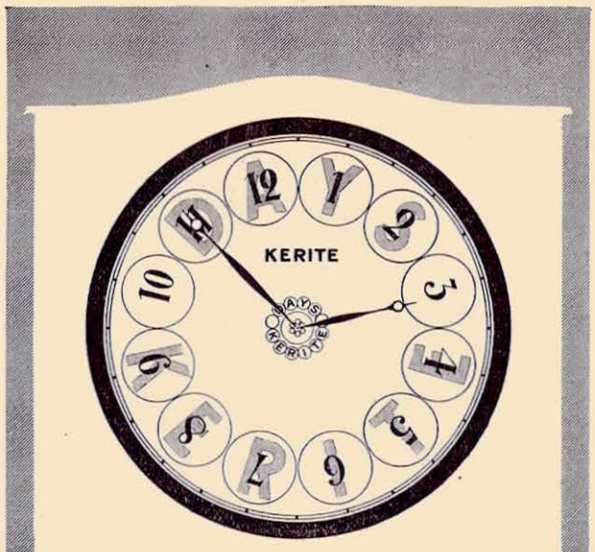

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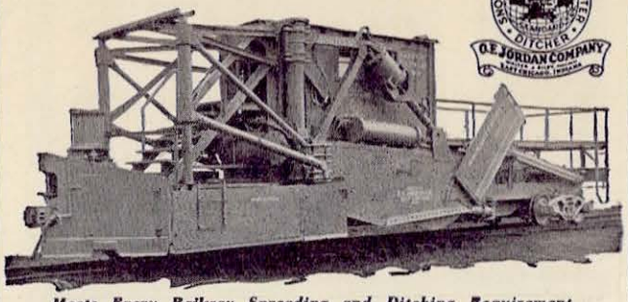

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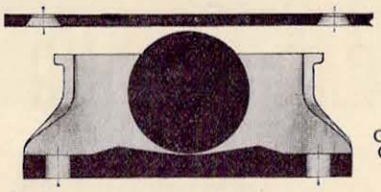

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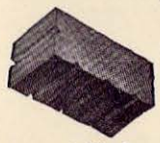

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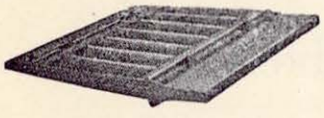

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Blowtorches, Acetylene.
Oxweld Railroad Service Co., The

Boiler Checks.
Prime Manufacturing Co., The

Boilers, Locomotive.
American Locomotive Co.
Baldwin Locomotive Works
Lima Locomotive Works.

Boilers, Scale Proof.
Industrial Brownhoist Corp.

Bolsters, Steel.
American Steel Foundries.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Gould Coupler Co., The
Mt. Vernon Car Mfg. Co.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Symington & Son, Inc., T. H.

Bolsters, Steel.
Ohio Steel Foundry Co., The.

Bolts and Nuts.
Bethlehem Steel Co.
Buffalo Brake Beam Co.
Dardelet Threadlock Corp.
Neely Nut & Bolt Co.
Russell, Burdsall & Ward Bolt and Nut Co.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

Bolts & Nuts, Monel Metal.
International Nickel Co., The.

Bolts, Patch.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Bolts, Track.
Illinois Steel Co.
Inland Steel Co.

Bonders, Rail.
Q & C Co., The.

Bonding Rail Outfits.
Ingersoll-Rand Co.

Bonds, Rail.
American Steel & Wire Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Bonds, Signal.
American Steel & Wire Co.
General Cable Corp.
Railroad Supply Co.

Bond Wire Protection.
P & M Co., The

Boosters, Locomotives.
Franklin Railway Supply Co., Inc.

Boring & Drilling Machines, Horizontal.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Boring Machines, Car Wheel.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Horizontal.
Sellers & Co., Inc., Wm.

Boring & Turning Mills, Vertical.
Sellers & Co., Inc.. Wm.

Braces, Rail.
Bettendorf Co., The
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
Q. & C. Co., The.
Ramapo Ajax Co.
Symington Co., The.

Brake Beam Safety Guards.
Chicago Railway Equipment Co.

Brake Beam Supports.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.

Brake Beams.
American Steel Foundries.
Bradford Corporation.
Buffalo Brake Beam Co.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Hunt-Spiller Mfg. Corp.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.

Brake Drums.
American Car & Foundry Motors Co.
Hunt-Spiller Mfg. Corp.

Brake Forgings, Pins, Levers, etc.
American Steel Foundries.
Brill Co., The J. G.
Davis Brake Beam Co.
Mt. Vernon Car Mfg. Co
Schaefer Equipment Co

Brakes, Hand.
National Brake Co.

Brake Heads.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
Davis Brake Beam Co.
Pressed Steel Car Co.

Brake Jaws.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Schaefer Equipment Co.
Steel Car Forge Co.

Brake Shoes.
American Brake Shoe & Foundry Co.
American Steel Foundries.
Brill Co., The J. G.
Buckeye Steel Castings Co.
Fort Pitt Malleable Iron Co.
Mt. Vernon Car Mfg. Co.

Brakes, Air.
General Electric Co.
Westinghouse Air Brake Co.

Brakes, Clasp.
American Steel Foundries.

Brakes, Electric.
Westinghouse Air Brake Co.

Brakes, Hand.
Miner, W. H.
National Brake Co.
National Malleable & Steel Castings Co.
Wine Railway Appliance Co.

Brass, Sash.
Edwards Co., O. M.

Brick, Locomotive Arch.
American Arch Co.

Bridge Builders.
American Bridge Co.
Bethlehem Steel Company.

Bridge Floors.
Armco Culvert Mfrs. Assoc.

Bridge & Crossing Plank, Creosoted.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Bridge Flooring.
Carey Co., The, Philip.

Bridge Material.
International Creosoting & Construction Co.

Bridge Material, Creosoted.
National Lumber & Creosoting Co.

Bridge Stringers — (See Stringers, Bridge).

Bronze Powder, Aluminum.
Aluminum Co. of America.

Bucket Handling.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Whiting Corporation.

Buckets, Grab.
American Bridge Co.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Buffers, Friction.
Edgewater Steel Co.
Miner, W. H.
Standard Coupler Co.
Waugh Equipment Co.
Westinghouse Air Brake Co.

Buffers, Radial.
Franklin Railway Supply Co., Inc.

Building Materials.
Carey & Co., Philip, The.
Johns-Manville Corp.

Buildings, Iron, Steel & Steel Concrete.
American Bridge Co.
United Engineers & Constructors, Inc.

Bulldozers.
Ryerson & Son, Joseph T.

Buses, Motor.
Reo Motor Car Co.

Bushings, Grease Cup.
Prime Mfg. Co., The.

Cable Accessories, Electrical.
General Cable Corp.
Graybar Electric Co.

Cables, Electric.
American Steel & Wire Co.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Co.
Graybar Electric Co.
Ketrie Insulated Wire & Cable Co.
Okonite Co., The.

Cableways—(See Tramways)

Caps, Grease.
Prime Mfg. Co., The.

Carbide Calcium.
Oxweld Railroad Co., The
Union Carbide Sales Co.

Car Insulation.
Carey & Co., Philip, The.

Car Lighting Equipment—(See Lighting Car Equipment).

Carlines.
Hutchins Car Rfg. Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Car Material, Wood.
Central Coal & Coke Co.

Car Parts and Appliances.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.

Car Parts, Freight.
Bettendorf Co., The.
General American Tank Car Corporation.
Pressed Steel Car Co.

Car Parts, Passenger.
Brill Co., The J. G.
St. Louis Car Co.

Car Repairs.
General American Tank Car Corporation.
Pressed Steel Car Co.
St. Louis Car Co.
Tennessee Coal, Iron & Railroad Co.

Car Retarder Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Car Siding (See Siding Car, etc.)

Cars, Baggage.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Cars, Ballast.
Bethlehem Steel Company.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Caboose, Coal & Stock.
Mt. Vernon Car Mfg. Co.

Cars, Convertible.
Mt. Vernon Car Mfg. Co.

Cars, Dump.
Bethlehem Steel Company.
Bettendorf Co., The
Differential Steel Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Flat, Narrow Gauge.
Bettendorf Co., The.
Western Wheeled Scraper Co.

Cars, Freight.
Bethlehem Steel Co.
Bettendorf Co., The
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Co.

Cars, Freight (New and Repaired).
Bethlehem Steel Company.
Bettendorf Co., The.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Gasoline-Electric.
Brill Co., The J. G.
Electro-Motive Co.
St. Louis Car Co.

Cars, Gasoline Motor.
Brill Co., The J. G.
St. Louis Car Co.

Cars, Hand & Push.
Fairbanks-Morse & Co.

Cars, Industrial.
Bethlehem Steel Company.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Motor.
Fairbanks-Morse & Co.

Cars, Motor Inspection.
Fairbanks-Morse & Co.

Cars, Oil Electric.
Westinghouse Elec. & Mfg. Co.

Cars, Ore.
Brill Co., The J. G.
General American Tank Car Corp.
Pressed Steel Car Co.

Cars, Passenger.
Bethlehem Steel Company.
Brill Co., The J. G.
Electro Motive Co.
Pressed Steel Car Co.
Pullman Car & Mfg. Corp.
St. Louis Car Co.

Cars, Power Units.
Brill Co., The J. G.
Electro Motive Co.

Cars, Quarry.
Western Wheeled Scraper Co.

Cars, Rebuilt and Repaired.
Bettendorf Co., The
General American Tank Car Corp.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Refrigerator.
General American Tank Car Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Cars, Second-Hand.
Pressed Steel Car Co.
Western Wheeled Scraper Co.

Cars, Self-Propelled Passenger.
Brill Co., The J. G.
Electro Motive Co.
General Electric Co.
Pullman Car & Mfg. Corp.
Westinghouse Elec. & Mfg. Co.

Cars, Spreader.
Jordan Co., O. F.
Western Wheeled Scraper Co.

Cars, Tank.
Bethlehem Steel Company.
General American Tank Car Corp.
Pressed Steel Car Co.

Carts, Dump.
Western Wheeled Scraper Co.

Castings, Alloy Steel.
Symington Co., The
Union Spring & Mfg. Co.

Castings, Brass and Bronze.
General Railway Signal Co.
Magnus Co., Inc.
National Bearing Metals Corp.
Union Switch & Signal Co.

Castings, Gray Iron.
American Brake Shoe & Foundry Co.
American Locomotive Co.
Baldwin Locomotive Works
General Railway Signal Co.
Mt. Vernon Car Mfg. Co.
Rampo Ajax Corp.
Union Switch & Signal Co.

Castings, Gun Iron.
Hunt-Spiller Mfg. Corp.

Castings, Iron & Steel.
Industrial Brownhoist Corp.

Castings, Malleable Iron.
Buckeye Steel Castings Co.
Chicago Railway Equipment Co.
Fort Pitt Malleable Iron Co.
National Malleable & Steel Castings Co.
P & M Company, The.
Pressed Steel Car Co.
Symington Co., The
Universal Draft Gear Attachment Co.

Castings, Monel Metal.
International Nickel Co., The.

Castings, Steel.
Allegheny Steel Co.
American Locomotive Co.
American Steel Foundries.
Bethlehem Steel Co.
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach Co.
Buckeye Steel Castings Co.
General Steel Castings Corp.
Gould Coupler Co., The
McConway & Torley Co.
Midvale Co., The.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Steel Casting Co.
Universal Draft Gear Attachment Co.

Castings, Steel Loco.
Birdsboro Steel Foundry & Mach. Co.
General Steel Castings Corp.
Gould Coupler Co., The
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Castings, Steel Vanadium.
Birdsboro Steel Foundry & Mach Co.
Brill Co., The J. G.
Ohio Steel Foundry Co., The.
Standard Steel Works Co.
Union Steel Casting Co.

Catchbasins, Corrugated Iron.
Armco Culvert Mfrs. Assoc.

Cellers, Engine Truck.
Ardco Mfg. Co.

Cement Car, Asphalt.
Lehon Co., The
Sherwin-Williams Co.

Cement, High Temperature.
Carey Co., Philip, The.
Johns-Manville Corp.

Cements, Asbestos and Magnesia.
Carey Co., Phillip, The.

Center Plates — (See Bearings, Center).

Center Sills.
Bettendorf Co., The.
Bradford Corporation.

Chain Monel Metal.
International Nickel Co. The.

Chemicals.
Bird-Archer Co., The.
Dearborn Chemical Co.
Hunt Co., Robert W.

Chemicals, Boiler.
Bird-Archer Co., The.

Chemicals, Cleaning.
Oakite Products, Inc.

Chemists.
Bird-Archer Co., The
Dearborn Chemical Co.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Chromium.
Electro Metallurgical Sales Corp.

Chromium Plating.
Worthington Pump & Machinery Corp.

Chucks, Lathe.
Ryerson & Son, Jos. T.

Cinder Handling Plants.
Roberts & Schaefer Co.

Circuit Breakers.
General Electric Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Clamps, Flanging.
Ryerson & Sons, Jos. T.

Clamps, Guard Rail.
O. & C. Co., The.
Westinghouse Air Brake Co.

Clamps, Hose.
Ingersoll-Rand Co.
National Malleable & Steel Castings Co.
Vapor Car Heating & Lighting Co.
Westinghouse Air Brake Co.

Clamps, Pipe.
Franklin Railway Supply Co., Inc.
National Malleable & Steel Castings Co.

Clamps, Rail Cutting.
Oxweld Railroad Service Co., The.

Classification Yard Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Cleaners, Aircraft.
Oakite Products, Inc.

Cleaners, Air Pump.
Oakite Products, Inc.
Westinghouse Air Brake Co.

Cleaners, Bus & Truck.
Oakite Products, Inc.

Cleaners, Car.
Oakite Products, Inc.

Cleaners, Flue.
Ryerson & Son, Jos. T.

Cleaners, General.
Oakite Products, Inc.

Cleaners, Locomotive.
Oakite Products, Inc.

Cleaners, Metal.
Oakite Products, Inc.

Clips, Wire Rope.
American Hoist & Derrick Co.

Coach and Coach Yard Steam Joints—(See Joints, etc.)

Coaches, Motor.
American Car & Foundry Motors Co.
Dodge Motor Truck Corp.
International Harvester Co.
White Co., The.

Coaches, Second-Hand.
Hyman-Michaels Co.

Coal, Ore & Ash Handling Machinery.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.
Roberts & Schaefer Co.

Coal Pushers.
Standard Stoker Co.

Coaling Stations.
American Bridge Co.
Fairbanks-Morse & Co.
Roberts & Schaefer Co.

Cocks, Angle.
Westinghouse Air Brake Co.

Cocks, Blow-Off.
Bird-Archer Co., The.

Cocks, Cylinder.
Prime Manufacturing Co., The.

Columns, Water.
Prime Manufacturing Co., The.

Combination Crane Pile Drivers.
Industrial Brownhoist Corp.

Compounds, Boiler.
Dearborn Chemical Co.
Bird-Archer Co., The
General Electric Co.

Compounds, Cleaning.
Oakite Products, Inc.

Compounds, Cutting.
Oakite Products, Inc.

Compounds, Grinding.
Oakite Products, Inc.

Compounds, Paint Removing.
Oakite Products, Inc.

Compounds, Rust Proofing.
Oakite Products, Inc.

Compressors, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Concrete Floor Slabs.
Federal American Cement Tile Co.

Concrete Reinforcement.
American Steel & Wire Co.
Carnegie Steel Co.
Ryerson & Sons, Jos. T.

Concrete Roofing, Tile.
Federal American Cement Tile Co.

Condensers.
Ingersoll-Rand Co.

Condensing Apparatus.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Conduit, Rigid.
Aluminum Co. of America.

Conduits, Metallic Flexible.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Graybar Electric Co.
Vapor Car Heating Co., Inc.

Conduit, Underground.
Graybar Electric Co.
Johns-Manville Corp.

Connections.
Prime Manufacturing Co., The.

Connections, Lever.
National Malleable & Steel Castings Co.

Connections, Truck.
National Malleable & Steel Castings Co.

Connections, Truck Lever.
Schaefer Equipment Co.

Contraction Joint.
General Railway Signal Co.

Control Devices, Train Speed.
Union Switch & Signal Co.

Control, Locomotive.
Valve Pilot Co.

Controllers, Electric.
General Electric Co.
Westinghouse Electric & Mfg. Co.

Conveying Machinery.
American Bridge Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Orton Crane & Shovel Co.

Corrugated Sheet.
Aluminum Co. of America.

Conveyor, Ash — (See Coal Ore and Ash Handling Mach.)

Coupler Pockets—(See Draft Yokes.)

Coupler Yokes.
Bettendorf Co., The.
Gould Coupler Co.
Symington Co., The.

Couplers.
American Steel Foundries.
Buckeye Steel Castings Co.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
McConway & Torley Co.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Westinghouse Air Brake Co.

Couplings, Hose.
Fort Pitt Malleable Iron Co.
Ingersoll-Rand Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co

Cranes, Ballast Cleaning.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Barge.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Bracket.
Shephard-Niles Crane & Hoist Corp.

Cranes, Crawler.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Cranes, Crawling Shovels and Draglines.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton, Crane & Shovel Co.

Cranes, Diesel.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Electric Traveling.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Gantry.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Gasoline.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Grab Bucket.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Handpower.
American Hoist & Derrick Co.
Shephard-Niles Crane & Hoist Corp.

Cranes, Jib.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.
Worthington Pump & Machinery Corp.

Cranes, Locomotive.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.
Orton Crane & Shovel Co.

Cranes, Overhead.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Pillar.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Portable.
American Hoist & Derrick Co.

Orton Crane & Shovel Co.

Cranes, Tractor.
Orton Crane & Shovel Co.

Cranes, Transter.
Industrial Brownhoist Corp.
Milwaukee Electric Crane & Hoist Corp.

Cranes, Traveling.
Milwaukee Electric Crane & Hoist Corp.
Shephard-Niles Crane & Hoist Corp.

Cranes, Wharf.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Ohio Locomotive Crane Co.

Cranes, Wrecking.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Crank Pins — (See Pins, Cranks).

Creosote.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Constr. Co.
Jennison Wright Co.

Cribbing Units.
Federal American Cement Tile Co.

Cross Arms.
American Bridge Co.
General Electric Supply Corp.
Graybar Electric Co.
International Creosoting & Construction Co.

Cross Ties.
Century Wood Preserving Co.
International Creosoting & Construction Co.

Cross Ties, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Cross Ties, Steel.
Bethlehem Steel Co.

Crossheads & Shoes.
Baldwin Locomotive Wks.
Barco Mfg. Co.
International Creosoting & Construction Co.

Crossing Signals & Signs.
Railroad Supply Co.

Crossings — (See Frogs and Crossings).

Crossings, Pavement.
Carey Co., The Philip

Crushers, Coal.
American Sheet & Tin Plate Co.
Orton Crane & Shovel Co.

Culverts.
Armco Railroad Sales Co.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.
Toncan Culvert Manufacturers' Association.

Culverts Corrugated.
Armco Culvert Manufacturers' Association.
Republic Steel Corp.

Culverts, Paved Invert.
Armco Culvert Mfrs. Assoc.

Cupolas, Foundry.
Hammett, H. G.

Cups, Oil.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Curtains, Cab
Lehon Co., The

Curtains & Fixtures, Car Window.
Pantasote Co., Inc.. The.

Curtain Material, Car.
Ryerson & Son, Jos. T.

Cutting & Welding Apparatus.
Oxweld Railroad Service Co.
Westinghouse Elec. & Mfg. Co.

Cut-Off Indicators & Recorders.
National Tube Co.
Valve Pilot Co.

Cylinder Parts (Finished & Rough).

Cylinders, Air Brake.
Westinghouse Air Brake Co.

Cylinders, Cast Steel Locomotive.
General Steel Castings Corp.
Union Steel Casting Co.

Cylinders, Oxy-Acetylene.
Oxweld Railroad Co., The

Deoxidizers.
Q & C Co., The.
Vanadium Corp. of America.

Derricks.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Diesel Electric Power Plants
Fairbanks-Morse & Co.
Westinghouse Elec. & Mfg. Co.

Dirt Collectors.
Westinghouse Air Brake Co.

Disinfectants.
West Disinfecting Co.

Dispatching Systems.
General Railway Signal Co.
Union Switch & Signal Co.

Ditchers.
American Hoist & Derrick Co.
Jordan Co., O. F.

Ditching Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Door Fixtures—(See Fixtures Car Door).

Doors, Car.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
Wine Railway Appliance Co.

Doors, Folding, Rolling and Sliding.
Kinnear Manufacturing Co.

Doors, Locomotive Firebox.
Franklin Railway Supply Co., Inc.

Doors, Steel.
Kinnear Manufacturing Co.

Doors, Rolling, Steel.
Kinnear Mfg. Co.

Doors, Wood.
Kinnear Mfg. Co.

Draft Arms.
American Steel Foundries.
Birdsboro Steel Foundry & Mach. Co.
Bradford Corporation.
Symington Co., The.
Universal Draft Gear Attachment Co.

Draft Gear Attachments.
Symington Co., The.

Draft Gears.
American Steel Foundries.
Bradford Corporation.
Cardwell-Westinghouse Co.
Edgewater Steel Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.
Standard Coupler Co.
Union Draft Gear Co.
Universal Draft Gear Attachment Co.

Draft, Yokes
American Steel Foundries.
Bettendorf Co., The.
Buckeye Steel Castings Co.
Gould Coupler Co., The
McConway & Torley Co.
Miner, W. H.
Mt. Vernon Car Mfg. Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Co.
Symington Co., The
Universal Draft Gear Attachment Corp.

Draglines.
Orton Crane & Shovel Co.

Drainage Gates.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drains, Perforated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Drawbar Centering Device.
Gould Coupler Co., The
Miner, W. H.

Drawbars, Unit Safety.
Franklin Railway Supply Co., Inc.
Industrial Brownhoist Corp.

Dredging Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Drilling Machines.
Sellers & Co., Inc., Wm.

Drilling Machines, Bonding.
Railroad Supply Co.

Drilling Machines, Pneumatic.
Ingersoll-Rand Co.

Drilling Machines, Rock.
General Electric Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drilling Machines, Upright and Radial.
Ryerson & Son, Joseph T.
Sellers & Co., Inc., Wm.

Drills.
Ingersoll-Rand Co.

Drills, Close Corner.
Ingersoll-Rand Co.

Drills, Concrete.
Ingersoll-Rand Co.

Drills, Steel Rock and Steel Sharpened.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Drills, Track & Bending.
Bird-Archer Co., The.
Ingersoll-Rand Co.

Drinking Cups.
U. S. Envelope Co.

Drive Gas Electric Coaches.
General Electric Co.

Drive Gas Electric Locomotives
Westinghouse Elec. & Mfg. Co.

Driving Boxes (Extended Main).
Franklin Railway Supply Co., Inc.

Drop Door Mechanism.
Wine Railway Appliance Co.

Dynamos — (See Generators Electric).

Electrical Cable Accessories.
General Cable Corp.
General Electric Supply Corp.

Electric Cables.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Supply Corp.

Electrical Instruments.
Electric Service Supplies Co.
Railroad Supply Co.
Westinghouse Elec. & Mfg. Co.

Electrical Supplies.
General Electric Co.
General Electric Supply Corp.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Electrification, Railroad.
Battey & Kipp.
General Electric Co.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg. Co.

Electric Heaters.
General Electric Supply Corp.

Electrical Insulation.
General Cable Corp.
General Electric Supply Corp.

Electrical Porcelain Insulators.
General Electric Supply Corp.

Electric Motors.
General Electric Supply Corp.

Electric Rivet Heaters.
General Electric Supply Corp.

Electric Switches.
General Electric Supply Corp.

Enamels.
du Pont de Nemours & Co., Inc., E. I.
Sherwin-Williams Co.

End Frames, Cast Steel, Passenger Car
General Steel Castings Corp.

Ends, Steel.
Hutchins Car Rfg. Co.
Union Metal Products Co.

Engineers, Consulting, Civil, Elec., Hydraulic, Mechanical.
Battey & Kipp.
Hunt Co., Robt. W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Contracting.
Battey & Kipp.
United Engineers & Constructors, Inc.

Engineers and Contractors.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
United Engineers & Constructors, Inc.

Engineers, Construction.
Battey & Kipp.
Roberts & Schaefer Co.
United Engineers & Constructors, Inc.

Engineers and Contractors, Elec. Hydraulic, Mech.
Battey & Kipp.
Hunt Co., Robert W.
Muhlfeld, John E.
Roberts & Schaefer Co.

Engineers, Inspecting.
Gulick-Henderson Co.
Hunt Co., Robert W.
Muhlfeld, John E.
Pittsburgh Testing Laboratory.
United Engineers & Constructors, Inc.

Engineers, Valuation.
Hunt Co., Robert W.
United Engineers & Constructors, Inc.

Engines, Crude & Fuel Oil.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Diesel.
Worthington Pump & Machinery Corp.

Engines, Gas.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Engines, Gas & Gasoline.
American Car & Foundry Motors Co.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Engines, Hoisting.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.

Envelopes.
U. S. Envelope Co.

Excavators.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.

Exhaust & Heater Pipe.
Union Asbestos & Rubber Co.

Exhaust & Ventilating Fans.
General Electric Supply Corp.

Expanders, Tube.
Ryerson & Son, Joseph T.

Explosives.
American Steel & Wire Co.
du Pont de Nemours & Co., Inc., E. I.

Fans, Exhaust & Ventilating.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Fasteners, Car Door.
Camel Sales Co.
Fort Pitt Malleable Iron Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Feed Water Heater Systems.
Bird-Archer Co., The.
Coffin, Jr., Co., The J. S.
Worthington Pump & Machinery Corp.

Fence Posts.
International Creosoting & Construction Co.

Fencing Wire — (See Wire Fence).

Fence Posts, Creosoted.
National Lumber & Creosoting Co.

Ferro Alloys.
Vanadium Corp. of America.

Ferro, Chromium.
Vanadium Corp. of America.

Ferro Molybdenum.
Electro Metallurgical Sales Corp.
Vanadium Corp. of America

Ferro Silicon.
Vanadium Corp. of America.

Ferro Tungsten.
Vanadium Corp. of America.

Ferro Vanadium.
Vanadium Corp. of America.

Filters, Air.
Westinghouse Air Brake Co.

Filters, Water & Industrial.
Graver Tank & Mfg. Corp.

Filtration Plants, (Water).
Graver Tank & Mfg. Corp.

Fireboxes.
American Locomotive Co.
Baldwin Locomotive Works

Fire Fighting & Protection Equipment.
Johns-Manville Corp.

Fittings, Air Brakes.
Westinghouse Air Brake Co.

Fittings, Steam.
Vapor Car Heating Co., Inc.

Fixtures, Car Door.
Camel Sales Co.
Chicago Railway Equipment Co.
Miner, W. H.
National Malleable & Steel Castings Co.

Flangers, Snow.
Q & C Co., The.

Floodlights.
General Electric Supply Corp.
Graybar Electric Co.
Oxweld Railroad Service Co.
Pyle-National Co.
Symington Co., The.
Westinghouse Elec. & Mfg. Co.

Floodlights, Acetylene.
Oxweld Railroad Service Co., The.

Flooring.
Carey & Co., Philip, The.
Jennison-Wright Co.
Johns-Manville Corp.

Flooring, Car.
Tuco Products Corp.

Flooring, Coach.
Tuco Products Corp.

Flooring, Composition.
Johns-Manville Corp.
Tuco Products Corp.

Flooring, Creosoted.
Central Coal & Coke Co.

Flooring, Wood.
Central Coal & Coke Co.
Century Wood Preserving Co.

Floor Plates, Steel.
Carnegie Steel Co.
Illinois Steel Co.

Floor Slabs, Concrete.
American Cement Tile Mfg. Co.

Flue Cleaners—(See Cleaners, Flue).

Flue Cutters—(See Cutters, Flue).

Flues, Boiler — (See Tubes Boiler).

Flue Shop Equipment.
Ryerson & Son, Joseph T.

Forges, Rivet Heating.
Ryerson & Son, Joseph T.

Forging Hammers.
Industrial Brownhoist Corp.

Forgings.
American Bridge Co.
American Steel Foundries.
Bethlehem Steel Company.

Brill Co., The J. G.
Carnegie Steel Co.
Edgewater Steel Co.
General Railway Signal Co.
Gould Coupler Co., The
Illinois Steel Co.
Midvale Co., The.
Mt. Vernon Car Mfg. Co.
Neely Nut & Bolt Co.
Pressed Steel Car Co.
Standard Steel Works Co.
Steel Car Forge Co.
Universal Draft Gear Attachment Co.

Forgings, Drop.
Brill Co., The J. G.
General Railway Signal Co.
Steel Car Forge Co.
Union Switch & Signal Co.

Forgings, Monel Metal.
International Nickel Co., The.

Foundry Supplies.
Bird-Archer Co., The

Frames, Cast Steel, Locomotive
General Steel Castings Corp.

Frames, Locomotive.
American Steel Foundries.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Ohio Steel Foundry Co., The.
Union Steel Casting Co.

Frames, Truck.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works
Bettendorf Co., The.
Birdsboro Steel Foundry & Mach. Co.
Buckeye Steel Castings Co.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.
Gould Coupler Co., The.
Ohio Steel Foundry Co., The.
Pressed Steel Car Co.
Pyle-National Co.
Symington Co., The

Frames, Vanadium.
American Locomotive Co.
Baldwin Locomotive Works
Birdsboro Steel Foundry & Mach. Co.
Union Steel Casting Co.

Frogs and Crossings.
Bethlehem Steel Company.
Continuous Rail Crossing Corp.
Ramapo Ajax Corp.

Fulcrums, Brake Beam.
American Steel Foundries.
Brill Co., The J. G.
Chicago Railway Equipment Co.
National Malleable & Steel Castings Co.

Furnaces, Electric.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Furnaces, Gasoline.
Railroad Supply Co.
Whiting Corporation.

Furnaces, Rivet Heating — (See Forges, Rivet Heating).

Furniture.
Aluminum Co. of America.

Gage Testers—(See Testers Gage).

Gages, Air.
Westinghouse Air Brake Co.

Gages, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Gages, Steam.
Ashton Valve Co.

Gages, Wheel Press Recording.
Ashton Valve Co.

Gaskets.
Westinghouse Air Brake Co.

Gasoline.
Ethyl Gasoline Corp.

Gear Blanks, Rolled Steel.
Edgewater Steel Co.
Standard Steel Works Co.

Gears and Pinions.
American Steel Foundries.
Westinghouse Elec. & Mfg. Co.

Gears, Silent.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Gears, Valve — (See Valve Gears).

Generators, Acetylene.
Oxweld Railroad Service Co.

Generators, Car Lighting.
Safety Car Heating & Lighting Co.

Generators, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Goggles, Welding.
Oxweld Railroad Service Co., The.
Sunbeam Electric Mfg. Co.

Graders, Elevating.
Western Wheeled Scraper Co.

Graphite Penetrating Oil.
Alemite Mfg. Corp.

Grapples, Wood.
Industrial Brownhoist Corp.

Grate Bars.
Q & C Co., The.

Grate Shakers, Automatic.
Franklin Railway Supply Co., Inc.

Grates.
Firebar Corp.

Greases.
Alemite Mfg. Corp.

Grease Forming Machines.
Franklin Railway Supply Co., Inc.

Grey Iron.
American Brake Shoe & Foundry Co.

Grinders, Internal.
Micro Machine Co.

Grinding Machines.
Sellers & Co., Inc., Wm.

Grinding Machines, Portable.
Ingersoll-Rand Co.

Guard Rails, Creosoted Wood
International Creosoting & Construction Co.

Guard Rails, Foot Guard.
Q & C Co., The.

Guard Rails (One Piece).
Bethlehem Steel Company.
Ramapo Ajax Corp.

Guard Switch Point.
Q & C Co., The.

Guards, Cattle.
American Bridge Co.

Guards, Dust.
Gould Coupler Co., The
Symington Co., The.

Hair Felt.
Johns-Manville Corp.

Hammers, Pneumatic.
Ingersoll-Rand Co.

Hammers, Riveting.
Ingersoll-Rand Co.

Hammers, Steam.
Industrial Brownhoist Corp.
Sellers & Co., Inc., Wm.

Hand Brakes—(See Brakes, Hand).

Hangers, Ball Bearing.
S. K. F. Industries, Inc.

Hand Rails & Fittings.
Aluminum Co. of America.

Hangers, Bottom Rod Safety.
Chicago Railway Equipment Co.

Hangers, Car Door — (See Fixtures, Car Door).

Headlight Repair Parts, Electric.
Electric Service Supplies Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Headlights, Electric.
General Electric Co.
Sunbeam Electric Mfg. Co.
Westinghouse Electric & Mfg. Co.

Headlights, Reflectors & Cases.
Pyle-National Co.
Sunbeam Electric Mfg. Co.

Heaters, Electric.
Westinghouse Electric & Mfg. Co.

Heaters, Electric Rivet.
American Hoist & Derrick Co.

Heaters, Feedwater.
Graver Tank & Mfg. Corp.

Heaters, Feedwater Locomotive.
Coffin Co., Jr., The J. S.
Superheater Company, The.
Worthington Pump & Machinery Corp.

Heaters, Feed Water, Stationary.
Brill Co., The J. G.
Worthington Pump & Machinery Corp.

Heating & Ventilating Apparatus.
Vapor Car Heating Co., Inc.
Westinghouse, Electric & Mfg. Co.

Heating Equipment, Car.
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Heating Systems, Car (Electric and Steam).
Safety Car Htg. & Ltg. Co.
Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

High Temperature Cements.
Carey & Co., Philip, The.

Highway Crossing Protection Devices.
American Bridge Co.
Franklin Railway Supply Co., Inc.
Railroad Supply Co.

Hoists, Chain.
Milwaukee Electric Crane & Hoist Corp.
Ryerson & Son, Jos. T.

Hoists, Electric.
American Hoist & Derrick Co.
Milwaukee Electric Crane & Hoist Corp.

Hoists, Pneumatic.
Ingersoll-Rand Co.

Hoists, Second-Hand.
Hyman-Michaels Co.

Hoisting Machinery.
American Hoist & Derrick Co.
Industrial Brownhoist Corp.
Orton Crane & Shovel Co.
Milwaukee Electric Crane & Hoist Corp.

Hooks, Wrecking.
National Malleable & Steel Castings Co.

Horns, Pneuphonic.
Westinghouse Air Brake Co.

Hose, Air, Steam, Etc.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Hose, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Hose, Tender.
Prime Manufacturing Co., The.
Westinghouse Air Brake Co.

Ice Cutters.
Jordan Co., O. F.

Incandescent Lamps.
General Electric Supply Corp.

Indicators, Speed & Cut-off.
Valve Pilot Co.

Ingots.
Birdsboro Steel Foundry & Mach. Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
McConway & Torley Co.
Standard Steel Works Co.

Injectors, Exhaust Steam.
Sellers & Co., Inc., Wm.
Superheater Co., The.

Inspection of Material and Equipment—(See Engineers, Inspection).

Insulated Wire.
Anaconda Wire & Cable Co.
General Cable Corp.
General Electric Supply Corp

Insulation, Car.
Carey Co., Philip, The.
Lehon Co., The.

Insulation, Car Bldg.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Electrical.
General Cable Corp.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Insulation, Exhaust & Heater Pipe.
Carey Co., Philip, The.
Johns-Manville Corp.
Tuco Products Corp.
Union Asbestos & Rubber Co.

Insulation, Heat.
Carey Co., Philip, The.
Miner, W. H.

Insulation Tape.
General Electric Supply Corp.

Insulators, Electrical, Porcelain.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Interlocking Plant Equipment.
General Railway Signal Co.
Union Switch & Signal Co.

Iron Chain.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Charcoal.
Bethlehem Steel Co.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.

Iron, Engine Bolt.
Lockhart Iron & Steel Co.

Iron, Forging Billets.
Lockhart Iron & Steel Co.

Iron, Hollow Staybolt.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Hollow Staybolt Bars.
Bethlehem Steel Co.
Falls Hollow Staybolt Co.
Ryerson & Son, Joseph T.

Iron, Pig.
Bethlehem Steel Co.

Iron, Refined.
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Iron, Staybolt — (See also Staybolts).
Ewald Iron Co.
Falls Hollow Staybolt Co.
Lockhart Iron & Steel Co
Reading Iron Co.
Ryerson & Son, Jos. T.

Jacking, Locomotive
Carey Co., Philip, The.

Jacks, Smoke.
Carey Co., Philip, The.
Johns-Manville Corp.

Joints, Air Reservoir.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Blow Off Line (Roundhouse).
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Coach and Coach Yard.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Joints, Flexible.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Flexible Ball.
Barco Mfg. Co.

Joints, Rail.
American Steel Foundries.
Carnegie Steel Co.
Illinois Steel Co.
Q & C Co., The.
Rail Joint Co.
Union Switch & Signal Co.

Joints, Steam, Air & Liquid.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.
Vapor Car Heating Co., Inc.

Joints, Swing.
Barco Mfg. Co.
Vapor Car Heating Co., Inc.

Journal Boxes and Lids.
Allegheny Steel Co.
American Steel Foundries.
Brill Co., The J. G.
Gould Coupler Co., The.
Hunt-Spiller Mfg. Corp.
National Malleable & Steel Castings Co.
Pullman Car & Mfg. Corp.
Railway Steel Spring Co.
Symington Co., The.
Union Spring & Mfg. Co.

Journal Oilers, Car & Locomotive.
Ardco Mfg. Co.

Keys, Brake Shoe.
Bradford Corporation.
Mt. Vernon Car Mfg. Co.
Steel Car Forge Co.
Union Spring & Mfg. Co.

Knuckles Emergency.
Q & C Co., The.

Laboratories, Testing.
Hunt Co., Robert W.
Pittsburgh Testing Laboratory.

Lacquers.
General Electric Supply Corp.
Sherwin-Williams Co.

Ladders, Steel Car.
Wine Railway Appliance Co.

Lagging, Locomotive.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lamps, Incandescent.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lamps, Inspector's.
Oxweld Railroad Service Co., The.

Lath, Metal.
Armco Railroad Sales Co.
Truscon Steel Co.

Lathes, Axle.
Sellers & Co., Inc., Wm.

Lathes, Engine.
Ryerson & Son, Joseph T.

Lathes, Wheel.
Sellers & Co., Inc., Wm.

Lead, White.
National Lead Co.

Lighting Equipment, Car.
Electric Storage Battery Co.
Safety Car Htg. & Ltg. Co.

Lighting Fixtures and Systems.
General Electric Supply Corp.
Graybar Electric Co.
Pyle-National Co.
Safety Car Htg. & Ltg. Co.

Lighting Plants, Gas, Electric
Sunbeam Electric Mfg. Co.

Lightning Arresters.
General Electric Supply Corp.

Line Material.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Lock Nuts—(See Nut Locks).

Locomotive Water Conditioners.
Bird-Archer Co., The.

Locomotives, Contractors.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Electric.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

Locomotives, Gasoline.
Baldwin Locomotive Works.

Locomotives, Gas-Electric.
Electro Motive Co.

Locomotives, Geared.
Lima Locomotive Works.

Locomotives, Industrial.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Mine.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Lima Locomotive Works.
Westinghouse Elec. & Mfg. Co.

Locomotives, Oil Engine, Electric Driven.
American Locomotive Co.
Baldwin Locomotive Works.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.
Whitcomb & Co., Geo. D.

Locomotives, Rebuilt.
American Locomotive Co.

Locomotives, Repair Parts.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotives, Second-Hand.
Hyman-Michaels Co.

Locomotives, Steam.
American Locomotive Co.
Baldwin Locomotive Works.
Lima Locomotive Works.

Locomotive Stokers.
Standard Stoker Co.

Locomotive Valve Pilot.
Valve Pilot Co.

Lubricants.
Alemite Mfg. Corp.

Lubrication Equipment.
Alemite Mfg. Corp.

Lubrication Systems.
Alemite Mfg. Corp.

Lubricators, Driving Box.
Franklin Railway Supply Co., Inc.

Lubricators, Piston Rod.
Q & C Co., The.

Lumber.
Central Coal & Coke Co.
Curtin-Howe Corp.
West Coast Lumber Trade Extension Bureau.

Lumber, Asbestos.
Carey & Co., Philip, The.
Johns-Manville Corp.

Lumber, Creosote Treated.
International Creosoting & Construction Co.

Lumber, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Industrial Lumber & Creosoting Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Machinery, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Machine Screws, Monel Metal
International Nickel Co., The.

Magnets, Lifting.
Industrial Brownhoist Corp.
Electro Metallurgical Sales Corp.

Mechanical Draft Apparatus—(See Heating and Vent. App.)

Mechanical Stokers.
Standard Stoker Co.

Melters, Snow, Electric.
Q & C Co., The.

Metallic Flexible Conduit.
General Electric Supply Corp.

Meters, Water & Oil.
Worthington Pump & Machinery Corp.

Milling Machines, Planer Type.
Sellers & Co., Inc., Wm.

Milling Machines, Plain and Universal.
Ryerson & Son, Joseph T.

Mohair Upholstery Velvets
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Molybdenum Metal.
Vanadium Corp. of America.

Monel Metal, Rods, Sheets, Tubes, Wire, etc.
International Nickel Co., The.

Motors, Electric.
Fairbanks-Morse & Co.
General Electric Co.
Graybar Electric Co.
Westinghouse Elec. & Mfg. Co.

Motors & Generators.
Fairbanks-Morse & Co.

Moulding.
Aluminum Co. of America.

Multiple V Belt Drives
Worthington Pump and chinery Corp.

Nails.
American Steel & Wire Co.
Reading Iron Co.
Ryerson & Son, Joseph T.

Nipples, Air Hose.
Prime Manufacturing Co.

Nozzles, Exhaust.
Franklin Railway Supply Co., Inc.

Nozzles, Oxy-Acetylene Cutting.
Oxweld Railroad Service Co., The.

Nuts—(See Bolts and Nuts).

Nut Locks.
Dardelet Threadlock Corp.
Grip Nut Co.
Reliance Mfg. Co.

Nuts, Tank Hose.
Prime Manufacturing Co., The.

Office Appliances.
Remington-Rand Business Service

Oil-Electric Locomotives.
American Locomotive Co.
General Electric Co.
Ingersoll-Rand Co.
Westinghouse Elec. & Mfg. Co.

Oil Filtering & Storage Systems.
Graver Tank & Mfg. Corp.

Oil, Linseed.
National Lead Co.

Oil Plugs, Steam Chest.
Franklin Railway Supply Co., Inc.

Oxy-Acetylene Apparatus.
Oxweld Railroad Service Co., The.

Oxygen.
Oxweld Railroad Service Co., The.

Packing, Air Pump.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.
Westinghouse Air Brake Co.

Packing, Cylinder and Valve Ring.
Hunt-Spiller Mfg. Corp.
Westinghouse Air Brake Co.

Jacking, Locomotive.
Johns-Manville Corp.

Packing, Locomotive Cab Cock.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Ring Boiler.
Union Asbestos & Rubber Co.

Packing, Semi-Metallic.
Pilot Packing Co.
Central Alloy Steel Corp.

Packing, Sheet.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing, Soft.
Carey & Co., Philip, The.
Johns-Manville Corp.
Pilot Packing Co.
Union Asbestos & Rubber Co.

Packing, Throttle.
Johns-Manville Corp.
Union Asbestos & Rubber Co.

Packing.
Westinghouse Air Brake Co.

Paint Burners, Acetylene.
Oxweld Railroad Service Co., The.

Paint, Metal Protective.
National Lead Co.
Sherwin-Williams Co

Paint, Powder.
Aluminum Co. of America.

Paint Spraying Equipment
De Vilbiss Mfg. Co., The.

Paints.
du Pont de Nemours & Co., Inc., E. I.
National Lead Co.
Sherwin-Williams Co.

Paper, Carbon.
Remington-Rand Business Service

Paper, Sheathing.
Carey & Co., Philip, The.
Lehon Co., The.

Pavement Breakers.
Ingersoll-Rand Co.

Pickling Equipment, Monel Metal.
International Nickel Co., The.

Pile Drivers.
American Hoist & Derrick Co.
Industrial Brownhoist Co.

Piling, Creosoted.
American Creosoting Co.
Century Wood Preserving Co.
International Creosoting & Construction Co.
Jennison-Wright Co.
National Lumber & Creosoting Co.

Piling, Sheet Steel.
American Bridge Co.
Carnegie Steel Co.

Pilot Beams, Cast Steel.
General Steel Castings Corp.
Gould Coupler Co., The

Pilots, Cast Steel.
General Steel Castings Corp.
Locomotive Finished Material Co.

Pins, Airbrake.
Steel Car Forge Company.

Pins, Center.
Miner, W. H.

Pins, Coupler Knuckle.
McConway & Torley Co.
National Malleable & Steel Castings Co.

Pins, Crank.
American Locomotive Co.
Baldwin Locomotive Works
Miner, Inc., W. H.
Standard Steel Works Co.
Union Asbestos & Rubber Corp.

Pipe Coverings.
Carey & Co., Philip, The.
Johns-Manville Corp.

Pipe Fittings—(See Fittings, Pipe).

Pipe, Metal Culvert.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Republic Steel Corp.

Pipe, Steel Signal.
National Tube Co.

Pipe, Wrought Iron.
Byers Co., A. M.
Reading Iron Co.

Planers, Plate.
Ryerson & Son, Jos. T.
Sellers & Co., Inc., Wm.

Plates.
Steel Car Forge Co.

Plates, Follower.
Steel Car Forge Co.

Plates, Boiler, Firebox—(See Steel Firebox).

Plates, Center—(See Bearings, Center).

Plates, Iron & Steel.
Armco Railroad Sales Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Plates, Tie.
Illinois Steel Co.
Inland Steel Company.
Railroad Supply Co.
Tennessee Coal, Iron & Railroad Co.

Plates, Tin and Terne.
American Sheet & Tin Plate Co.

Platforms, Car.
Gould Coupler Co., The.
Standard Coupler Co.

Platforms, Cast Steel, Passenger Car
General Steel Castings Corp.

Plows, Railroad and Grading.
Western Wheeled Scraper Co.

Plows, Snow.
American Locomotive Co.
Brill Co., The J. G.
Clark Tructractor Co.
Jordan Co., O. F.
Q & C Co., The.

Plugs, Arch Tube.
Prime Mfg. Co., The.

Plugs, Oil & Grease Cup.
Prime Mfg. Co., The.

Plugs, Washout.
Prime Mfg. Co., The.

Plush, Mohair.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Pneumatic Tools.
Ingersoll-Rand Co.

Poles.
Central Coal & Coke Co.
General Electric Supply Corp.
Graybar Electric Co.

Poles, Creosoted.
American Creosoting Co.
Central Coal & Coke Co.
Century Wood Preserving Co.
Graybar Electric Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Poles, Signal.
General Railway Signal Co.
International Creosoting & Construction Co.
Union Switch & Signal Co.

Poles, Steel Tubular.
Graybar Electric Co.
National Tube Co.

Poles, Zinc Metal Arsenite Treatment.
Curtin-Howe Corp.

Posts, Fence.
Curtin-Howe Corp.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Fence, Creosoted.
Inland Steel Co.
International Creosoting & Construction Co.
National Lumber & Creosoting Co.

Posts, Steel Fence.
American Steel & Wire Co.
Q & C Co., The.

Powder, Blasting—(See Explosives).

Powdered Coal Equipment.
Muhlfeld, John E.

Power Plants.
General Electric Co.
Muhlfeld, John E.
United Engineers & Constructors, Inc.
Westinghouse Elec. & Mfg Co.

Power Shovels.
American Hoist & Derrick Co.
Northwest Engineering Co.

Power Transmission Supplies.
Sellers & Co., Inc., Wm.
Wrought Iron Co. of America.

Preservatives, Wood.
Century Wood Preserving Co.
Jennison-Wright Co.

Presses, Flanging Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Presses, Hydraulic.
Birdsboro Steel Foundry & Mach Co.

Presses, Wheel.
Birdsboro Steel Foundry & Mach Co.
Sellers & Co., Inc., Wm.

Pulverizers, Coal — (See Crushers, Coal).

Pullshovels.
American Hoist & Derrick Co.

Pumping Stations.
Fairbanks-Morse & Co.

Pump Liners, Monel Metal.
International Nickel Co., The.

Pump Rods, Monel Metal.
International Nickel Co., The.

Pump Shafts, Monel Metal.
International Nickel Co., The.

Pumps, Hydraulic.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Pumps & Pumping Machinery.
Fairbanks-Morse & Co.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.
Worthington Pump & Machinery Corp.

Pumps, Vacuum.
Ingersoll-Rand Co.
Worthington Pump & Machinery Corp.

Punching and Shearing Machines.
Ryerson & Son, Joseph T.

Pushers, Coal.
Standard Stoker Co.

Pyrometers, Superheated Steam.
Superheater Co., The.

Rail Anchors.
Bethlehem Steel Co.
P. & M. Co., The.

Rail-Bonds.
American Steel & Wire Co.
General Cable Corp.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Rail Braces — (See Braces, Rail).

Rail Cranes.
American Hoist & Derrick Co.

Rail Reclamation Equipment.
Ryerson & Son, Joseph T.

Railroad Shops.
United Engineers & Constructors, Inc.

Rail Splice Plates — (See Joints, Rail).

Railroad Structures — (See Engineers and Contractors; also Building).

Rails.
Bethlehem Steel Co.
Carnegie Steel Co.
Hyman-Michaels Co.
Illinois Steel Co.
Inland Steel Co.
Tennessee Coal, Iron & Railroad Co.
Thomson Rail Corp.

Rails, Relaying.
Hyman-Michaels Co.

Railway Signals.
General Electric Supply Corp.

Rattan.
Hale-Kilburn Co.
Heywood-Wakefield Co.

Receivers, Air.
Ingersoll-Rand Co.
Westinghouse Air Brake Co.

Recorders, Speed & Cut-off.
Valve Pilot Co.

Rectifiers for Signal Work.
General Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.

Reducing Valves.
Vapor Car Heating Co., Inc.

Reflectors, Headlight.
Sunbeam Electric Mfg. Co.

Refrigerators.
American Radiator Co.
Wine Railway Appliance Co.

Regulators, Oxy-Acetylene.
Oxweld Railroad Service Co., The.

Relays.
General Railway Signal Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Removers, Paint & Varnish.
Oakite Products, Inc.

Repair Parts, Stoker.
Standard Stoker Co.
Q & C Company, The.

Retorts Creosoting.
Graver Tank & Mfg. Corp.

Reverse Gear, Power.
Barco Mfg. Co.
Franklin Railway Supply Co., Inc.

Rivet Cutters.
Ingersoll-Rand Co.

Riveters, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Riveting Machines.
Ingersoll-Rand Co.

Rivets.
Inland Steel Co.
Neely Nut & Bolt Co.
Ryerson & Son, Joseph T.
Pressed Steel Car Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Rods.
Neely Nut & Bolt Co.

Rolled Steel.
Carnegie Steel Co.

Roller Bearings (See Bearings, Roller).

Rolls, Bending & Straightening.
Birdsboro Steel Foundry & Mach. Co.

Roof Slabs, Concrete.
Federal American Cement Tile Co.

Roofing, Asbestos.
Carey & Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Buildings.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Lehon Co., The.
Johns-Manville Corp.

Roofing, Car.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey & Co., Philip, The.
Lehon Co., The.
Hutchins Car Rfg. Co.
Johns-Manville Corp.
Tuco Products Corp.
Union Metal Products Co.

Roofing, Corrugated.
Armco Railroad Sales Co.
American Sheet & Tin Plate Co.
Carey Co., Philip, The.
Johns-Manville Corp.

Roofing, Tile.
Federal American Cement Tile Co.

Roofing, Tile, Cement.
Federal American Cement Tile Co.

Roofing, Tin.
American Sheet & Tin Plate Co.

Rope, Wire — (See Wire Rope).

Rust Preventatives.
Dearborn Chemical Co.
Oakite Products, Inc.

Safe Ends.
National Tube Co.

Sand Drying Plants.
Roberts & Schaefer Co.

Sand Plants.
Railway Engineering Equipment Co.

Sanitary Products.
West Disinfecting Co.

Sash Balances.
Tuco Products Co.

Saws, Circular Metal.
Ryerson & Son, Joseph T.

Saws, High Speed, Friction.
Ryerson & Son, Joseph T.

Saws, Portable Rail.
Industrial Brownhoist Corp
Q & C Co., The.

Scales.
Fairbanks-Morse & Co.

Scrapers, Wheeled and Drag.
Western Wheeled Scraper Co.

Screens, Passenger Car.
Tuco Products Corp.

Seats, Car.
Brill Co., The J. G.
Hale-Kilburn Co.
Heywood-Wakefield Co.
St. Louis Car Co.

Seats, Coach.
Brill Co., The J. G.

Shafting.
Falls Hollow Staybolt Co.
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Standard Steel Works Co.

Shapers.
Ryerson & Son, Joseph T.

Shapes, Pressed Steel.
Pressed Steel Car Co.
Sellers & Co., Inc., Wm.

Shapes, Structural.
Bethlehem Steel Co.
Carnegie Steel Co.
Illinois Steel Co.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheds, Train.
American Bridge Co.
Inland Steel Co.

Sheets, Black and Galvanized.
Allegheny Steel Co.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Blue Annealed.
Allegheny Steel Co.

Sheets, Car & Building.
American Rolling Mill Co.

Sheets, Corrugated.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Carey Co., Philip, The.
Carnegie Steel Co.
Johns-Manville Corp.
Ryerson & Son, Joseph T.

Sheets, Corrugated and Plain.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sheets, Electrical.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Republic Steel Corp.
Ryerson & Son, Joseph T.

Sheets, Iron & Steel.
Armco Railroad Sales Co.
Bethlehem Steel Co.

Sheets, Locomotive Jacket.
American Sheet & Tin Plate Co.
Armco Railroad Sales Co.
Inland Steel Co.

Sheets, Polished or Planished. Iron.
American Rolling Mill Co.
American Sheet & Tin Plate Co.

Sheets, Steel.
American Rolling Mill Co., The.
Inland Steel Co.
Ryerson & Son, Joseph T.

Sherardising Plants.
General Electric Co.

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American Hoist & Derrick Co.
Industrial Brownhoist Corp

Shovels, Gasoline & Electric.
American Hoist & Derrick Co.

Shovels, Steam, Gasoline & Electric.
American Hoist & Derrick Co
Orton Crane & Shovel Co.

Siding, Bldg., Car, Corrugated & Plain.
Kinnear Mfg. Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Inland Steel Co.

Siding, Corrugated & Plain.
Carey & Co., Philip, The.
Johns-Manville Corp.

Siding, Iron & Steel.
American Rolling Mill Co.

Signal Accessories.
Electric Storage Battery Co.
General Electric Co.
General Railway Signal Co.
Graybar Electric Co.
Railroad Supply Co.
Union Switch & Signal Co.
Westinghouse Elec. & Mfg. Co.

Signals, Automatic Cab.
General Railway Signal Co.
Union Switch & Signal Co.

Signal Blades.
General Railway Signal Co.
Union Switch & Signal Co.

Signals, Crossing.
Union Switch & Signal Co.

Signals, Crossing Protection.
General Railway Signal Co.
Railroad Supply Co.

Signals, Railway.
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Silico Manganese.
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Slabs, Concrete Floor.
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Federal Cement Tile Co.

Slag, Blast Furnace.
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Slotting Machines.
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Sludge Removers.
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West Disinfecting Co.

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Union Spring & Mfg. Co.

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American Steel & Wire Co.
Pittsburgh Spring & Steel Co.
Railway Steel Spring Co.
Standard Steel Works Co.
Union Spring & Mfg. Co.
Union Switch & Signal Co.

Springs, Shop Equipment.
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International Creosoting & Construction Co.

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General Railway Signal Co.

Switch Movements.
Union Switch & Signal Co.

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Tele. & Tele. Wire.
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Testers, Boiler.
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Testers, Gage.
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Standard Steel Works Co.

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General Steel Castings Corp.

Trucks, Cast Steel, Electric Car
General Steel Castings Corp.

Trucks, Cast Steel, Car & Locomotive
General Steel Castings Corp.

Trucks, Dump.
Clark Tructractor Co.

Trucks, Electric Storage Battery.
Elwell-Parker Electric Co.

Trucks, Industrial.
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Trucks, Motor.
Dodge Motor Truck Corp.
General Motors Truck Co.
International Harvester Co.
Reo Motor Car Co.
White Co., The.

Trucks, Tender.
Flexible Truck Co.

Trucks, Trailer.
Brill Co., The J. G.
Franklin Railway Supply Co., Inc.

Tubes, Arch.
National Tube Co.

Tubes, Boiler.
Allegheny Steel Co.
Bethlehem Steel Co.
National Tube Co.
Ryerson & Son, Joseph T.

Tubes, Boiler, Charcoal Iron.
Bethlehem Steel Co.
Reading Iron Co.

Tubes, Staybolt.
Fails Hollow Staybolt Co.

Tubes, Tire.
Firestone Tire & Rubber Co.
Goodyear Tire & Rubber Co.

Tubing.
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Tubing, Seamless Steel.
National Tube Co.

Tungsten Metal.
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Turbo Generators.
Electric Service Supplies Co.
General Electric Co.
Pyle-National Co.
Sunbeam Electric Mfg. Co.
Westinghouse Elec. & Mfg. Co.

Turnbuckles.
American Bridge Co.
American Steel & Wire Co.
Ryerson & Son, Joseph T.

Turntable Tractors.
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Turntables.
American Bridge Co.
Industrial Brownhoist Corp.

Typewriter Ribbons.
Remington-Rand Business Service.

Typewriters.
Remington-Rand Business Service.

Uncoupling Device.
Hutchins Car Rfg. Co.

Undercrossings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Underfloor Duct.
General Electric Supply Corp.

Underfloor Duct, Fibre and Metal.
Johns-Manville Corp.

Underframes, Cast Steel. Tender
General Steel Castings Corp.

Underframes, Cast Steel, Freight Car.
General Steel Castings Corp.

Underframes, Steel.
Bettendorf Co., The.
Brill Co., The J. G.
Pressed Steel Car Co.
St. Louis Car Co.

Underground Conduit.
General Electric Supply Corp.

Upholstery, Car.
Brill Co., The J. G.
Chase & Co., L. C.
Massachusetts Mohair Plush Co.

Valve Gears, Locomotive.
Pyle-National Co.

Valves, Air Brake.
Westinghouse Air Brake Co.

Valves, Back Pressure Acetylene.
Oxweld Railroad Service Co., The.

Valves, Blow-Off.
Bird-Archer Co., The.

Valves, Check & Angle Steam
Sellers & Co., Inc., Wm.

Valves, Drifting.
Ardco Mfg. Co.
Sellers & Co., Inc., Wm.

Valves, Hydraulic.
Birdsboro Steel Foundry & Mach. Co.

Valves, Piston.
Franklin Railway Supply Co., Inc.

Valves, Pop, Safety & Relief.
Ashton Valve Co.
Vapor Car Heating Co., Inc.
Westinghouse Air Brake Co.

Valves, Throttle.
Bradford Corporation.

Vanadium.
Electro Metallurgical Sales Corp.

Varnish Powder.
Aluminum Co. of America.

Varnishes.
du Pont de Nemours & Co., Inc., E. I.
General Electric Supply Corp.
Sherwin-Williams Co.

Vapor Car Heating Co., Inc.
Wine Railway Appliance Co.

Ventilators, Shop & Roundhouse.
Carey Co., Philip, The.
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Wardrobes, Rolling and Disappearing Front — (See Lockers).

Washers.
National Malleable & Steel Castings Co.
Reliance Mfg. Co.
Ryerson & Son, Joseph T.
Wine Railway Appliance Co.

Washers, Boiler.
Sellers & Co., Inc., Wm.

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Reliance Manufacturing Co., The.

Water Alarms — (See Low Water Alarms).

Waterproofing Materials and Compounds.
Carey Co., Phillip, The.
Lehon Co., The.
Johns-Manville Corp.

Water Purifying Materials & Compounds.
Bird-Archer Co., The.
Dearborn Chemical Co.

Water Softening & Purifying.
Bird-Archer Co., The.
Dearborn Chemical Co.
Graver Tank & Mfg. Corp.

Weather Stripping.
Tuco Products Corp.

Wedges, Automatic.
Franklin Railway Supply Co., Inc.

Wedges, Journal Box.
American Steel Foundries.
Gould Coupler Co.
National Malleable & Steel Castings Co.
Pressed Steel Car Co.
Steel Car Forge Company.
Symington Co., The.

Weed Killer.
Q & C Co., The.

Welding Machines, Acetylene.
Oxweld Railroad Service Co., The.
Ryerson & Son, Joseph T.
Westinghouse Elec. & Mfg. Co.

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General Electric Co.
Ryerson & Son, Joseph T.

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Oxweld Railroad Service Co.
Franklin Railway Supply Co., Inc.

Welding Process.
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Welding Rods.
American Steel & Wire Co.
General Electric Supply Corp.
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Well Casings, Corrugated Iron.
Armco Culvert Mfrs. Assoc.
Republic Steel Corp.

Wheel Centers, Driving.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Birdsboro Steel Foundry & Mach. Co.
Edgewater Steel Co.
Hunt-Spiller Mfg. Corp.
Standard Steel Works Co.
Union Steel Casting Co.

Wheels, Car and Locomotive.
American Locomotive Co.
American Steel Foundries.
Baldwin Locomotive Works.
Bethlehem Steel Co.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Cast Iron, Chilled Tread.
Assn. of Mfrs. of Chilled Car Wheels.
Graybar Electric Co.
Griffin Wheel Co.
Mt. Vernon Car Mfg. Co.
Pressed Steel Car Co.

Wheels, Mine Car.
Carnegie Steel Co.
Edgewater Steel Co.
Mt. Vernon Car Mfg. Co.
Standard Steel Works Co.

Wheels, Passenger Car.
Carnegie Steel Co.
Illinois Steel Co.
Edgewater Steel Co.
Pullman Car & Mfg. Corp.
Standard Steel Works Co.

Wheels, Steel and Steel Tired
American Locomotive Co.
American Steel Foundries.
Carnegie Steel Co.
Edgewater Steel Co.
Illinois Steel Co.
Lima Locomotive Works.
Railway Steel Spring Co.
Standard Steel Works Co.

Wheels, Wrought Steel.
American Rolling Mill Co.
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American Steel & Wire Co.
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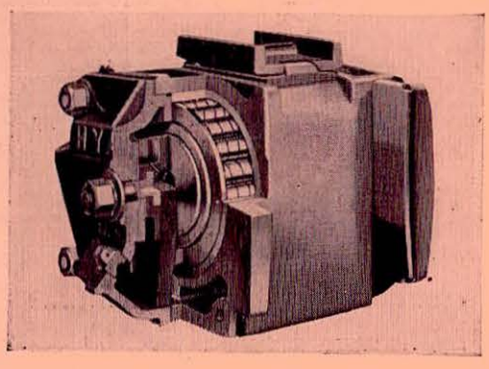

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Profit or loss . . . efficiency or trouble? Out of the figures of mileage costs comes the true story of bearing performance.

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PRODUCT OF GENERAL MOTORS

AS TO THE FUTURE*

"The business depression and the resultant reduction in volume of railroad business will exert a minimum deterring effect on the amount of signaling construction for 1931, as compared with that in other railroad fields.

"The underlying reason for continued activity in signaling is that the benefits produced include not only a reduction in train delays, but of perhaps more importance at this time is the direct saving in operating expense . . . which is particularly true in the consolidation of the control of interlockings in centralized traffic control systems and car retarder installations.

"Where savings of 40 per cent or more are evident under present traffic conditions, the quicker the installation is made the better as a means of reducing operating costs as soon as possible.

"Centralized traffic control speedily proved its place in railroading. On busy single-track lines the power operated switches reduce delays and the controlled signals keep trains moving. Likewise, such a system is also effective for either-direction operation of trains on one or more tracks of a multiple track line, as for example on the Boston & Maine. In the near future, centralized traffic control is expected to be installed on important single-track lines to direct train movements, with perhaps only a few passing track or junction switches power operated. The cost of the installation is to be justified primarily on the savings in operating expenses . . ."

*Excerpt from **RAILWAY SIGNALING**, January 1931, page 26.

UNION SWITCH & SIGNAL COMPANY
Swissvale, Pennsylvania

GENERAL RAILWAY SIGNAL COMPANY
Rochester, N. Y.

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Signals Aid Modern Motive Power to Produce More Ton-Miles Per Train-Hour